ust 1949

SEP 2

Chemical Industries

Including CHEMICAL SPECIALTIES

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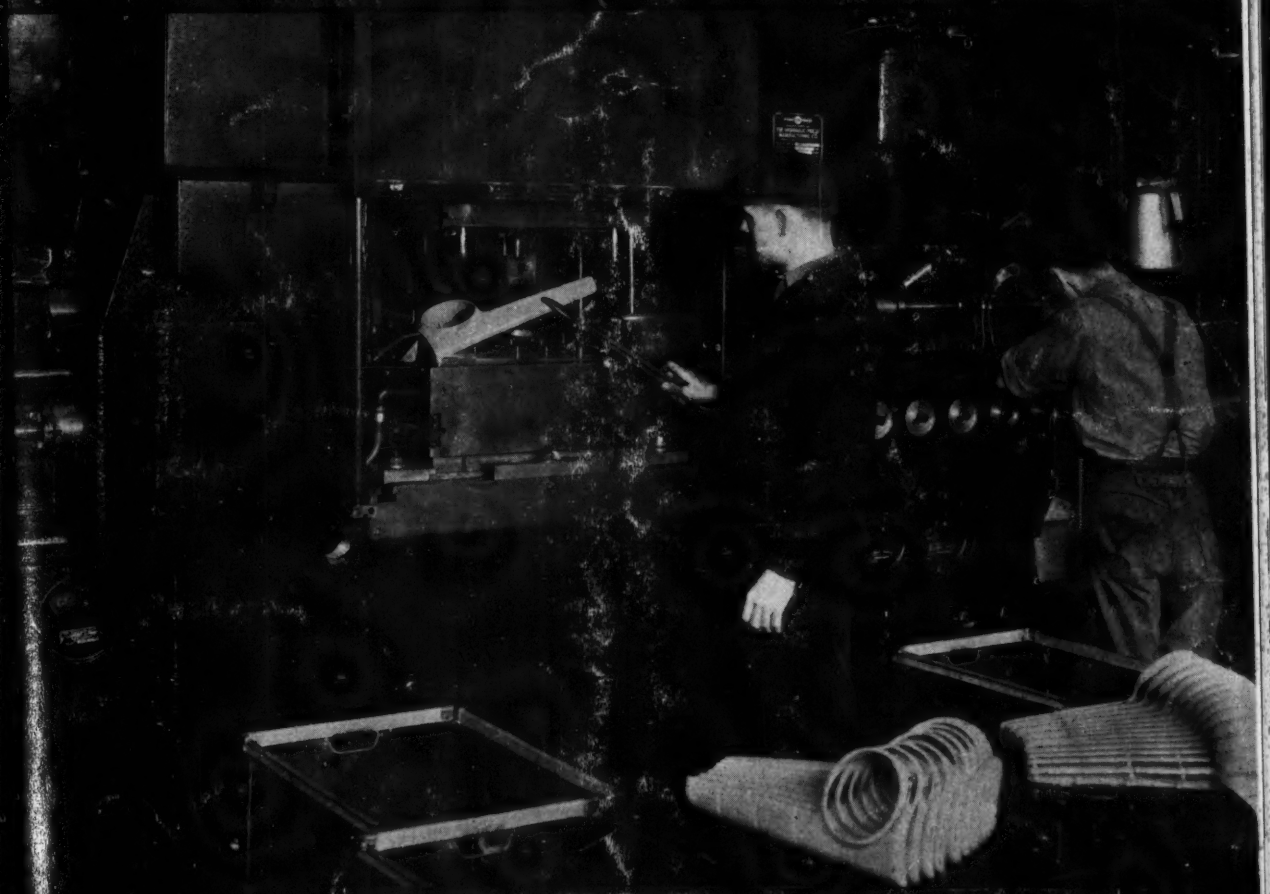

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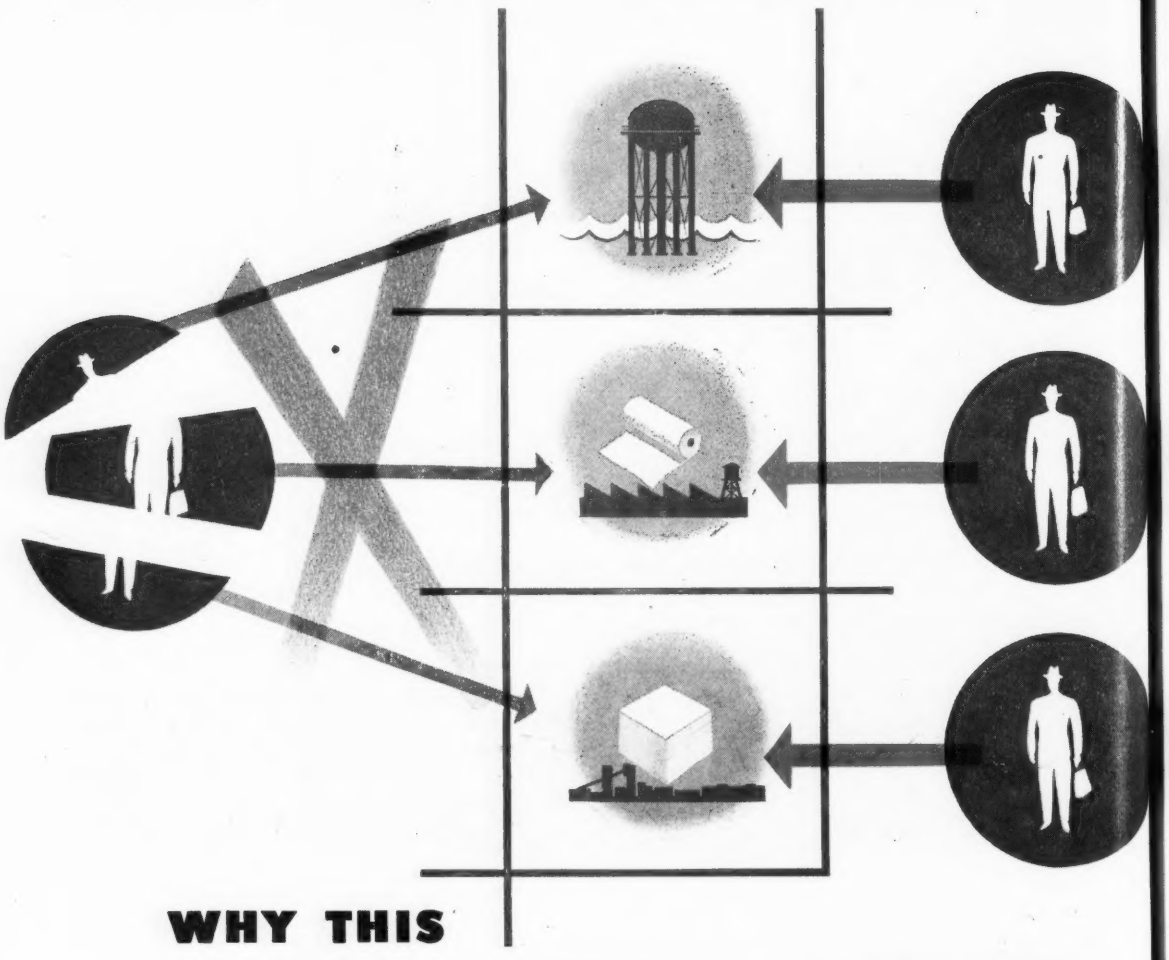
Cover: Injection molding dashboard panels



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Solvay Technical Service is organized on an "Industry-Wise" system . . . with Technical Service men who have spent their entire careers specializing in individual industries. The result—each man knows his industry and its problems more intimately; he can offer sound advice and practical help.

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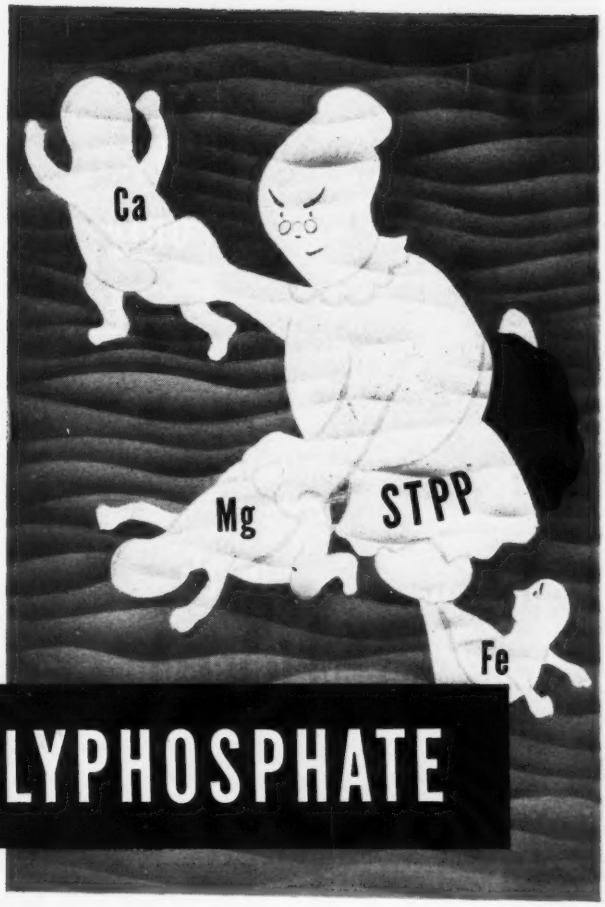

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Chemical Industries

Vol. 65, No. 2

AUGUST 1949

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

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Specific Gravity: 0.931 @ 20/20° C.

Acidity: 0.1% max., calc. as Acetic Acid

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THE READER WRITES

More Comments on the Alkali-Chlorine Picture

To the Editor of Chemical Industries:

The article "What's Ahead For the Alkali-Chlorine Industry" is one of the most complete and interesting articles I have read on this highly controversial subject. I might add that it must have required considerable courage on your part to attempt this assignment.

BERT CREMERS, Vice President
Wyandotte Chemicals Corp.
Wyandotte, Mich.

To the Editor of Chemical Industries:

I would like to compliment you on "What's Ahead For the Alkali-Chlorine Industry" in your June issue. Mr. Zabel's remarks certainly are pertinent on the large capital investment required to produce soda ash, particularly when compared to the present-day rate of return on that investment.

Referring to the always interesting trends of electrolytic caustic soda versus lime-soda caustic, I am certain you are familiar with the mechanics of plotting data with a logarithmic ordinate, and how misleading such plots can be. I am sure you appreciate that if one plots against a logarithmic ordinate values having a constant difference, in a straight line projection, these constant difference values will meet at a projected point due to the nature of the logarithmic function.

Referring to Fig. 3 of your article, and as you probably have done, if one plots the U. S. caustic soda production with a linear ordinate, it is rather surprising how lime-soda caustic has held its own. Actually, what the trend has been is that most of the increase in caustic production has been electrolytic caustic soda, with lime-soda caustic being fairly constant over the past fifteen to twenty years. Statistically this of course results in lime-soda caustic being a decreasing percentage of the total caustic production. There is no doubt that some time in the future electrolytic caustic is really going to put the skids under lime-soda caustic, although our data here indicate that the timing is not as imminent as the plot shown in your Fig. 3 because of the use of logarithmic ordinate.

C. C. BRUMBAUGH
General Manager, Research & Development
Diamond Alkali Co.
Painesville, Ohio

Explosive Mixture

To the Editor of Chemical Industries:

A recent violent explosion at the Du Pont Chambers Works, Deepwater Point, N. J., points up the danger of overheating a mixture of p-nitrotoluene and sulfuric acid. The fact that this hazard has not been generally recognized suggests that this explosion should be given wide publicity in the scientific and technical literature. Fortunately, only minor personal injuries were suffered by workmen in the building.

The explosion took place in a 500-gal. jacketed kettle in which 1000 lbs. of PNT (p-nitrotoluene) was being dissolved in 3995 lbs. of 93% sulfuric acid, when the temperature of the charge got out of control.

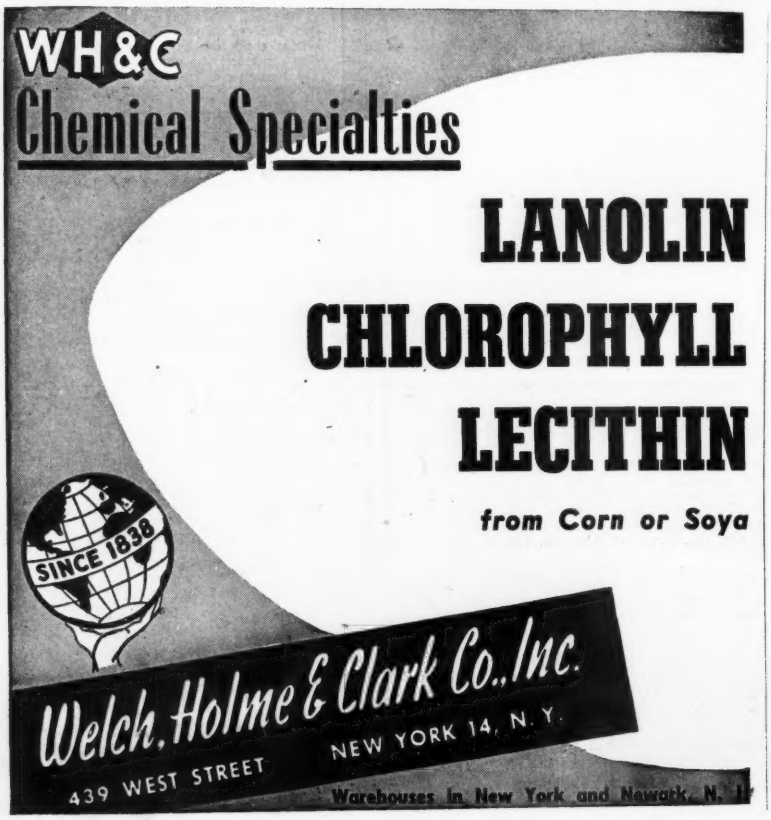
A careful study of all the conditions surrounding this occurrence has led to the belief that this explosion was identical with, or resulted from, the exothermic reaction which takes place with explosive violence when a PNT-sulfuric acid solution is heated to 160° C. Normal operating temperature for the PNT-sulfuric acid dissolving kettle is 80° C., maintained by steam heat.

Overheating of the charge was apparently caused by failure of the diaphragm valve on the automatic steam temperature controller, and subsequent attempts at manual control failed to check the temperature rise resulting from the strongly exothermic reaction which set in shortly after failure of the automatic temperature controller. The last temperature noted was 135° C., shortly beyond which the explosion occurred.

To minimize the danger associated with this potentially hazardous reaction, Du Pont has adopted the three following precautionary measures.

1. Installation of a 65° C. hot water circulating system on the heating coils in the PNT-sulfuric acid dissolving kettle, in place of steam heat.
2. Heating the sulfuric acid to 60-65° C. before adding the PNT, to effect rapid solution and to avoid lumping of the PNT while it is dissolving.
3. Providing a very rapid means of drawing off and drowning the PNT-sulfuric acid solution, should any unusual rise in temperature occur.

JAMES K. HUNT
E. I. du Pont de Nemours & Co., Inc.
Wilmington, Del.



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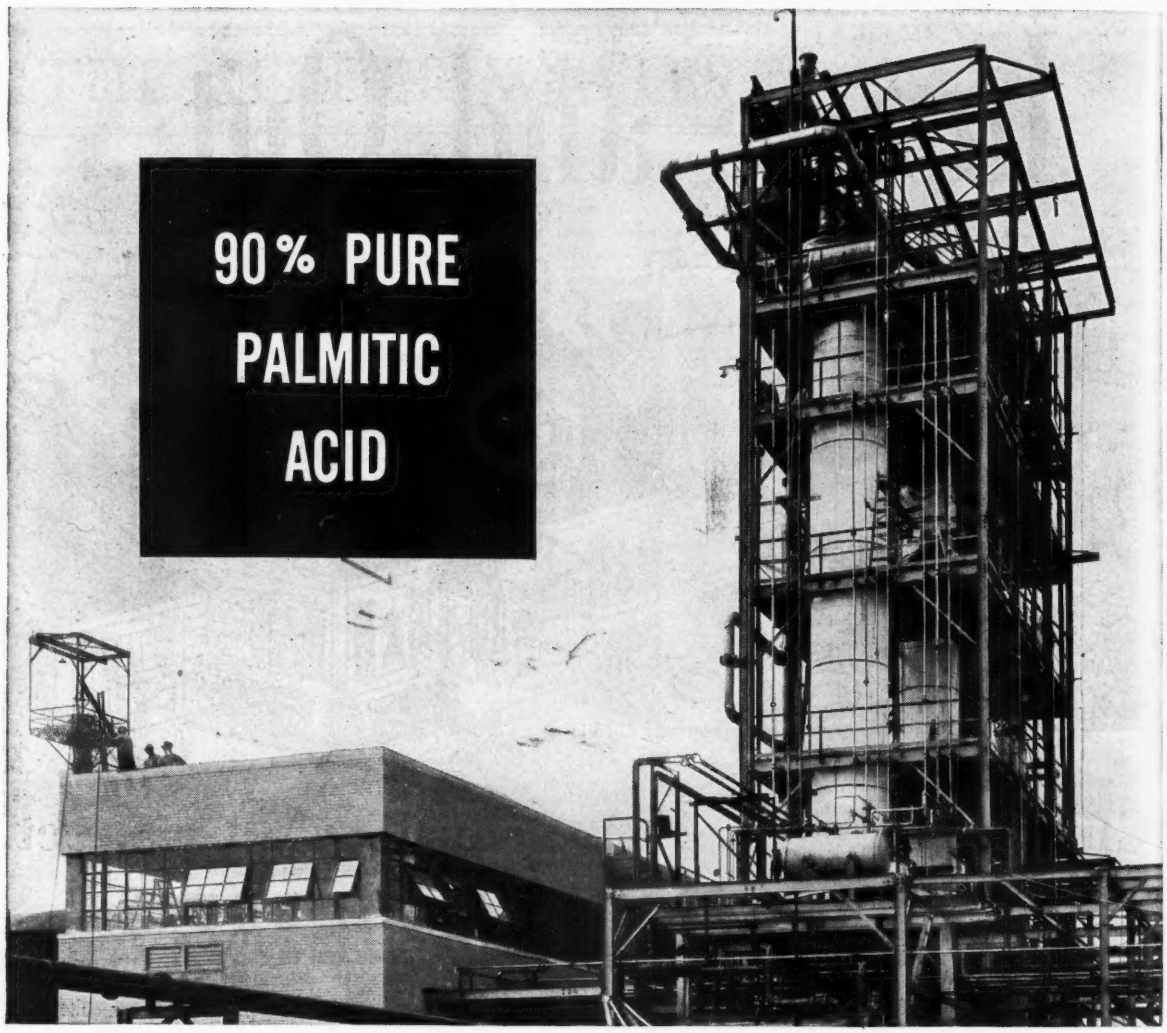

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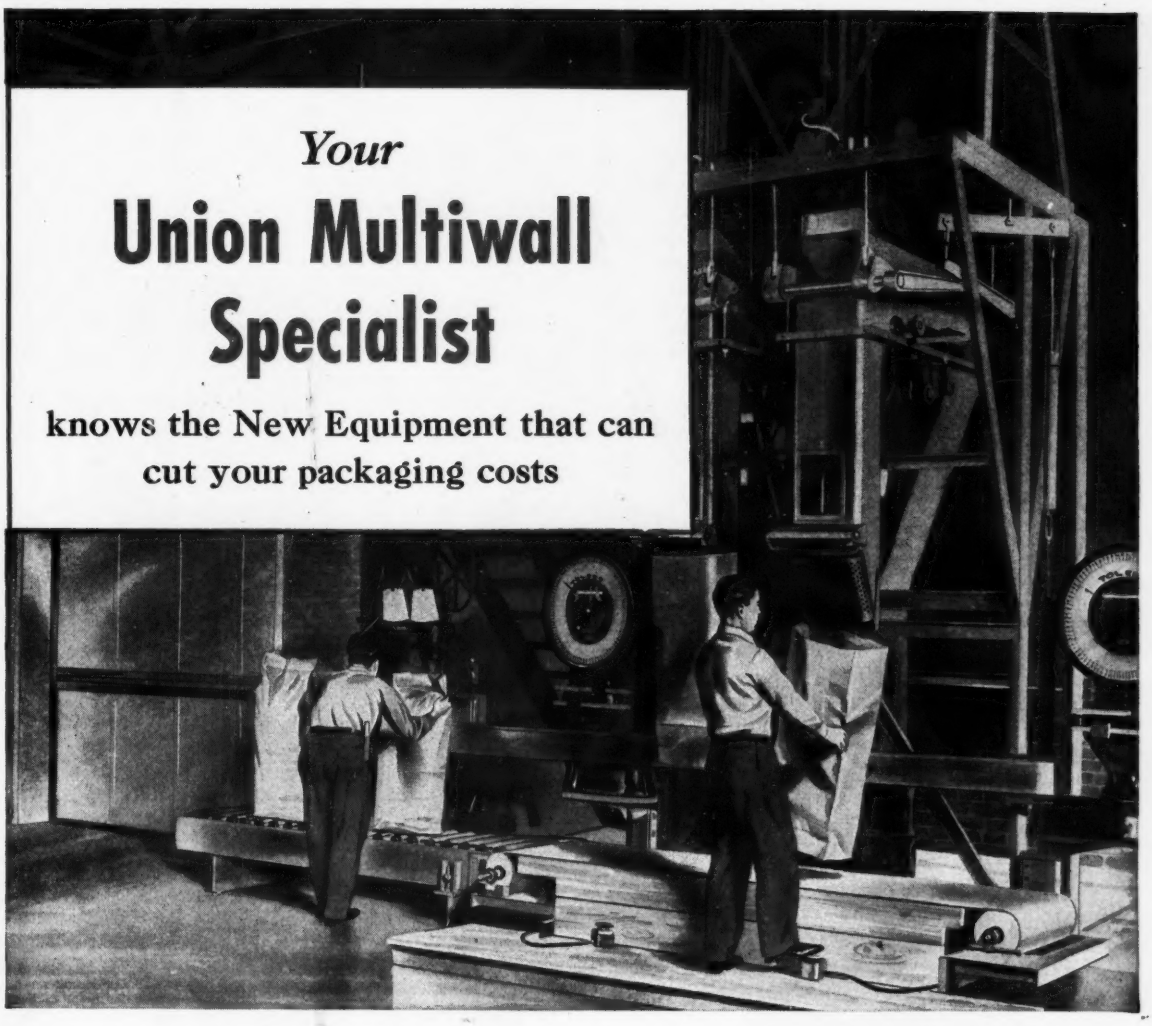

MULTIWALL bag packaging can be mechanized to a surprising degree. So if you are using pre-war packaging methods or equipment, your Union Multiwall Specialist can probably give you some money-saving ideas.

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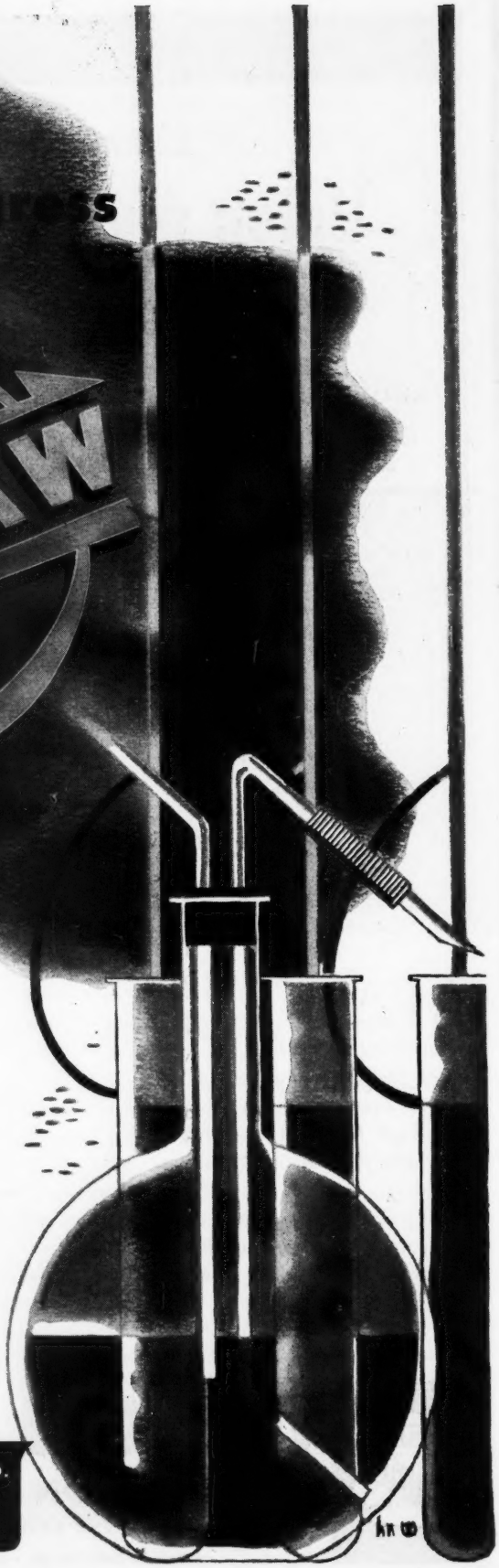

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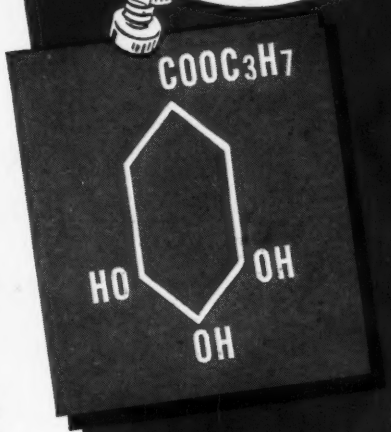

PROPERTIES

Appearance	Ivory, fine powder
Odor	Odorless
Taste	Tasteless in 0.01% solution
Melting Point	147°—149°C.
Solubility (g. per 100 g. solvent)	
Water at 25°C.	0.35
Water at 50°C.	1.8
Ethanol at 25°C.	103
Ether at 25°C.	83
Glycerol at 25°C.	25
Propylene Glycol at 25°C.	67
Cottonseed Oil at 30°C.	1.23
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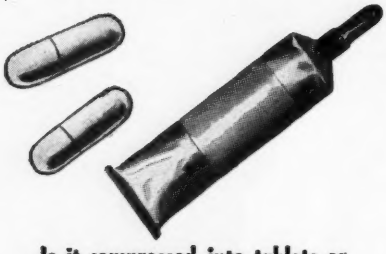

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contains not more than ½ mol. H_2O

EPHEDRINE HYDROCHLORIDE MERCK U.S.P.
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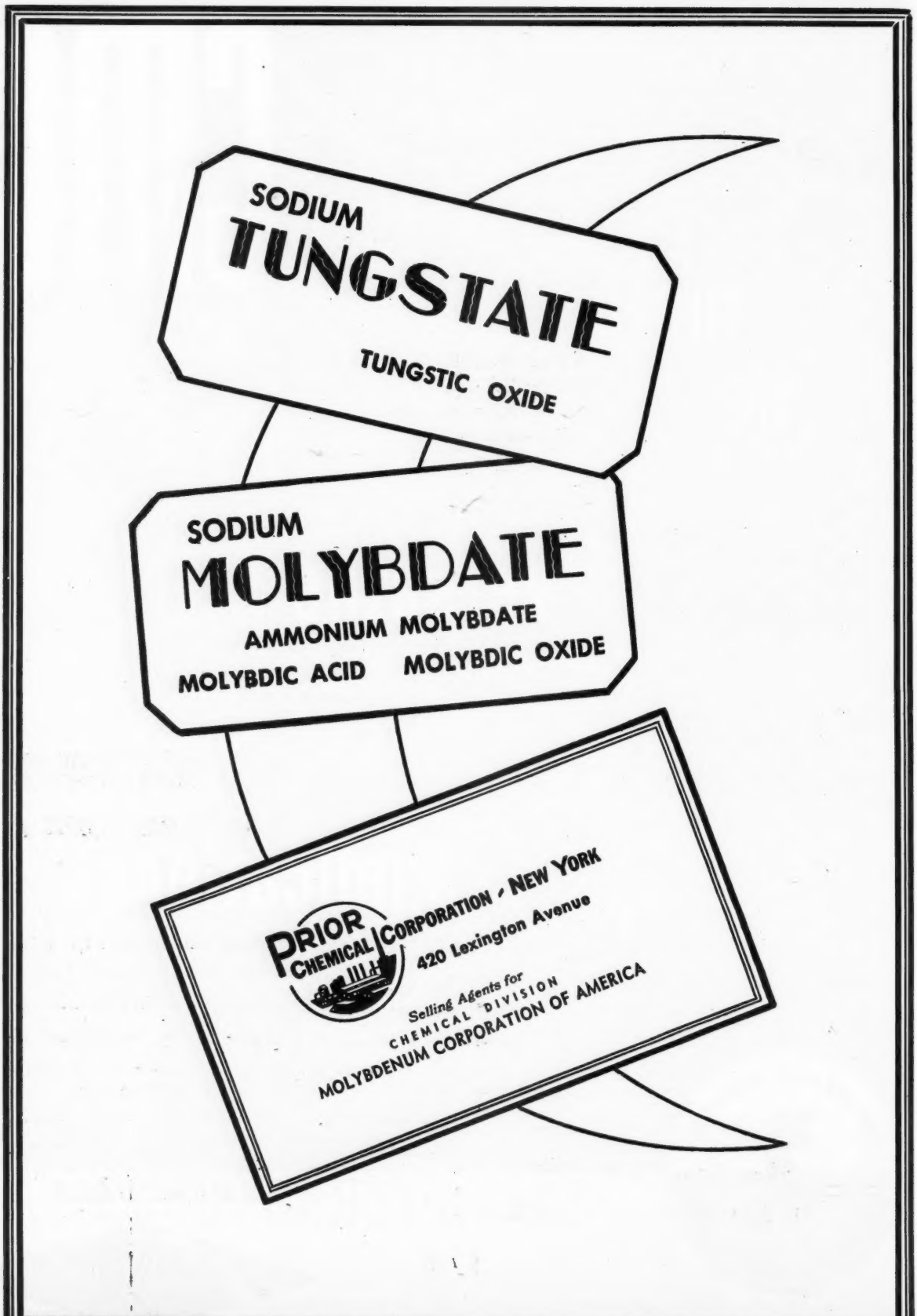
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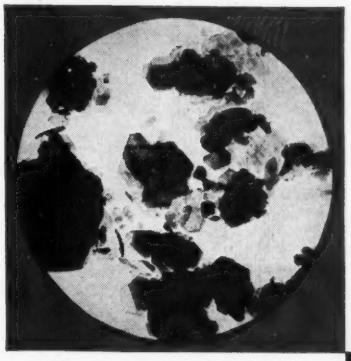
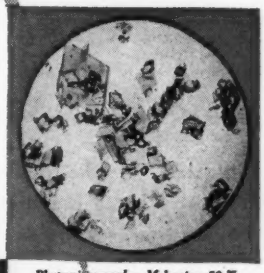


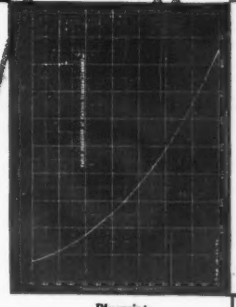
Electron micrograph—Kaolin Clay, 45,000 X.

Photostat—Austrian patent.

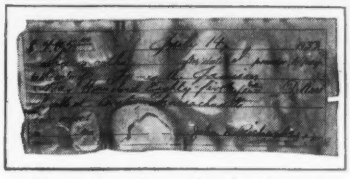


Photomicrograph—Melamine, 50 X.

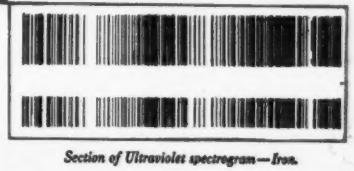
Photograph—burned promissory note made by ordinary photographic process, showing illegibility.



Blueprint.



Infra-red photograph—same burned promissory note.



Section of Ultraviolet spectrogram—Iron.

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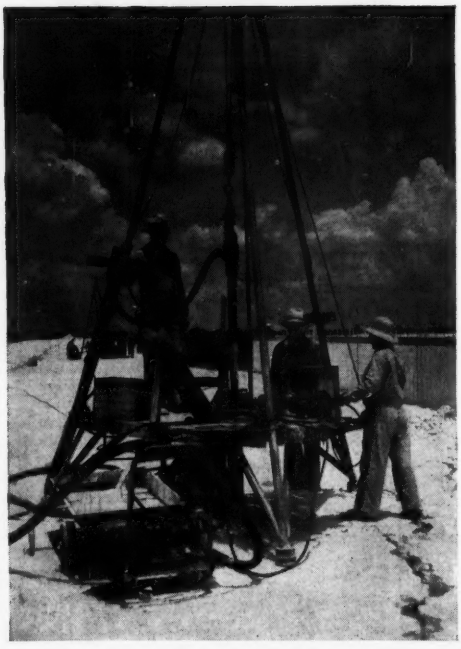
SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*BLASTING

Sulphur is blasted from the face of the vat as it is required for shipment. Vertical holes are drilled from the top of the vat, each hole being charged and exploded. Most of the sulphur is thereby broken into pieces of a size suitable for loading, such large pieces as occur being broken by hand to sizes which can be conveniently handled. Locomotive cranes load the sulphur into railroad gondolas, hopper bottom, or box cars. Such molten sulphur as is shipped is loaded direct from the pipe lines bringing sulphur from the producing wells.



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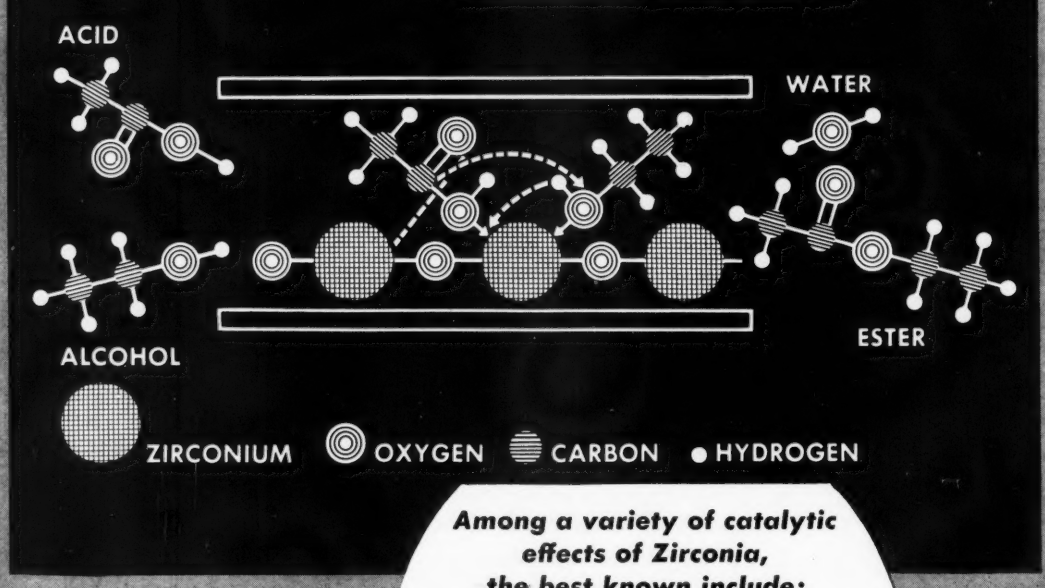
Rapid esterification process with high yield utilizes...

ZIRCONIA *Catalyst*



Among a variety of catalytic effects of Zirconia, the best known include:

THE ESTERIFICATION OF ORGANIC ACIDS WITH ALCOHOLS

THE PRODUCTION OF BUTADIENE

THE CRACKING OF HYDROCARBONS

THE CONDENSATION OF CERTAIN ORGANIC ACIDS

Research results show that Zirconia catalysts are effective in speeding many organic reactions. High yields of important commercial chemicals can be realized through their use. Zirconia is an extremely stable material and can be recovered quantitatively from a reactive system in which it is employed. It is non-toxic. In many ways, it is an ideal catalytic substance for processes yielding products that require high purity.

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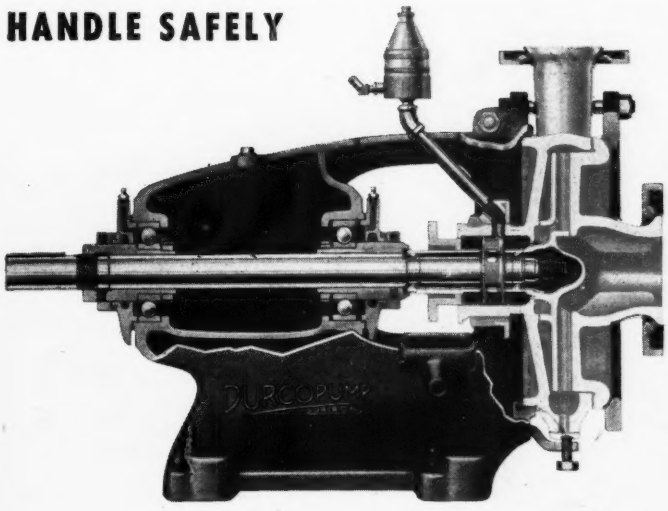
HERE'S A PARTIAL LIST....

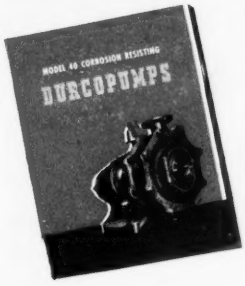
OF THE CORROSIVES THIS PUMP CAN HANDLE SAFELY



Acetic acid, all strengths
Alum
Aluminum sulfate + H_2SO_4
Ammonium chloride
Ammonium hydroxide
Ammonium sulfate
Arsenic acid
Barium chloride
Benzoic acid
Black liquor
Cadmium sulfate
Calcium bisulfite
Carbonic acid
Cellulose acetate
Chloroacetic acid
Chlorinated water
Chromic acid
Copper sulfate
Fatty acids
Ferric acetate
Ferric ferro-cyanide
Ferric sulfate
Ferrous sulfate
Formaldehyde
Formic acid
Hydrochloric acid
Hydrofluosilicic acid
Hydrogen peroxide
Hypochlorite bleach
Lead acetate
Lead nitrate
Maleic acid
Malic acid
Manganese chloride
Mercuric chloride
Mixed acid
Nickel chloride
Nicotine sulfate
Nitric acid, all strengths
Nitrobenzene
Oleic acid
Oleum
Oxalic acid
Phenol
Phosphoric acid
Phthalic acid
Potassium hydroxide
Potassium sulfate
Pyrogallic acid
Pyroligneous acid
Sodium bisulfite
Sodium ferricyanide
Sodium hydroxide
Sodium sulfite
Stannic chloride
Stannous chloride
Stearic acid
Sulfite liquors
Sulfur dioxide
Sulfuric acid
Sulfurous acid
Tannic acid
Tartaric acid
Vinegar
Zinc chloride
Zinc sulfate

A Durcopump can handle and resist practically any corrosive in commercial use today.

The reason—The wet end parts of Durcopumps are available in twelve different corrosion-resistant alloys. *Patterns are rigged and mounted, ready to produce any one of the required castings in our own foundry.* Foremost among these are the exclusive Durco alloys Duriron, Durichlor, Durimet and Chlorimet. Other alloys are Nickel, Monel, Inconel, Ni Resist, Nickel Cast Iron. Durco will help you select the alloy that will solve your corrosive pumping problem.



Further, the mechanical features of the Durcopump are a result of over 35 years of Chemical Pump Engineering. They assure lasting efficiency.

Model 40 Durcopumps are available in capacities up to 2000 g.p.m. for heads up to 230 feet. But, why not get the complete story. Send for the new Durcopump bulletin. Just fill out the coupon and mail it today.

DURCO Adv. 93-GM

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Please send me, without cost or obligation, a copy of your new Bulletin 815.

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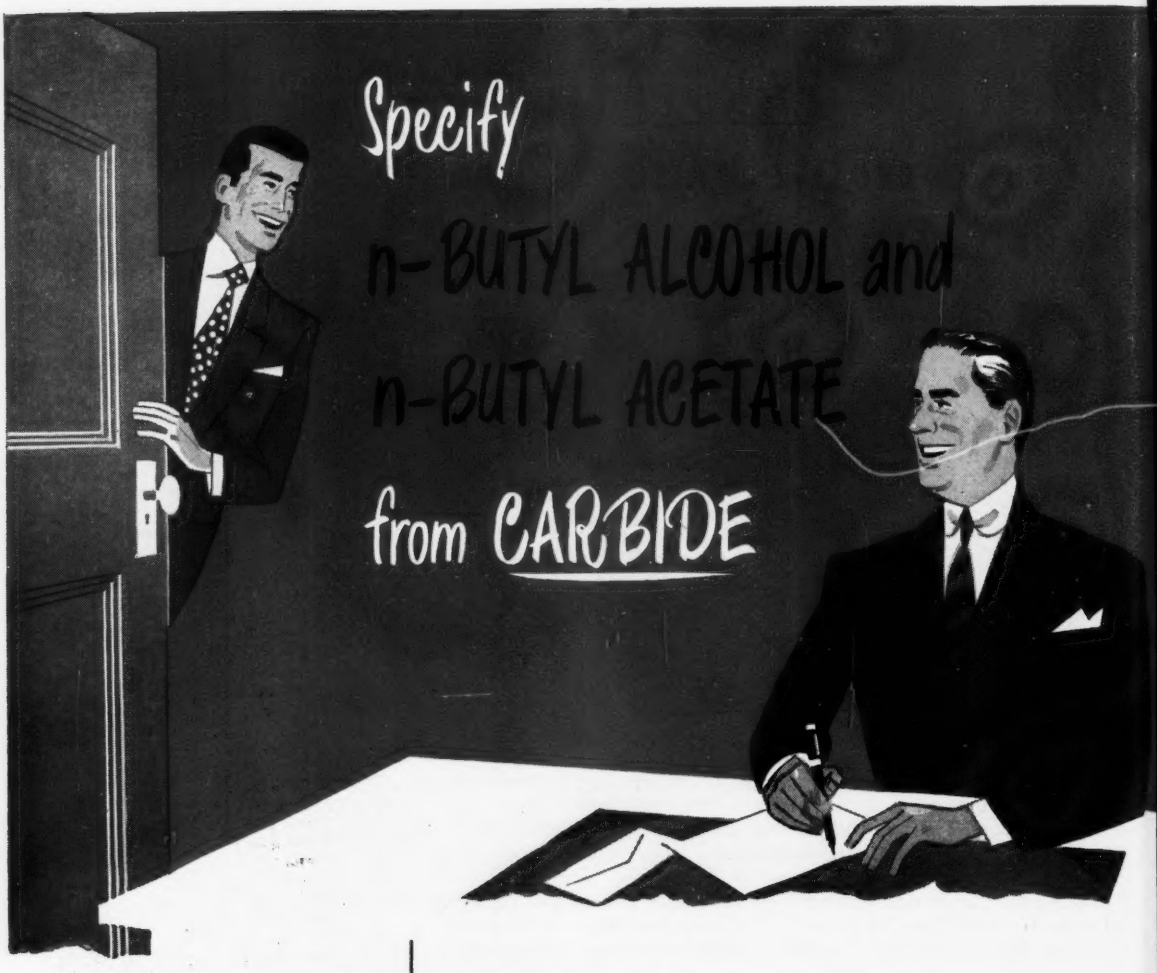

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Cost-savings...
Uniform purity...
Fast delivery...

COMBINED SHIPMENTS . . . you can take advantage of compartment tank car and combination carload prices by ordering n-Butyl Alcohol and n-Butyl Acetate from CARBIDE. There are over 200 other CARBIDE chemicals that may be combined with these products for cost-saving shipments.

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BASIC SOLVENT-COUPLER COMBINATION FOR QUALITY LACQUERS . . . high dilution ratio . . . low viscosity solutions with good blush resistance and flow-out . . . excellent resin solvency.

FAST DELIVERY . . . CARBIDE's Butyl Alcohol and Butyl Acetate are now stocked in 41 warehouses throughout the U. S. For prices and delivery information, get in touch with the nearest CARBIDE office.

For a complete listing of CARBIDE chemicals and their properties, send for "Physical Properties of Synthetic Organic Chemicals" (ask for F-6136-G).

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Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

Newsletter,
August, 1949

For Your Information:

Several oil companies are quietly investigating formaldehyde condensation resins made from the so-called "polymer" obtained as an unavoidable by-product of hydroforming (i.e., catalytic aromatization) of heavy naphtha in gasoline manufacture. This "polymer" is rich in naphthalene and more especially alkyl naphthalenes. Certain fractions of it, when condensed with formaldehyde, give a 75-85 per cent yield of a resin which in preliminary tests has shown excellent results in linseed and tung oil varnishes.

Hard, high-polishing sugar-cane wax, developed two years ago by the U. S. Department of Agriculture (CI, August 1947, p. 210), is being made by Colonial Sugars Co. at Gramercy, La., site of its refinery. Resembling the more costly carnauba, this sugar by-product is reportedly being sold to S. C. Johnson & Son--i.e., Johnson's Wax.

* * CI * *

American Smelting & Refining Co., which now has a zinc smelter in Corpus Christi, is looking into the possibilities for a new smelter in the Texas Gulf Coast area. (Pittsburgh and Baltimore are also being investigated.) With half of the industry's capacity still in old-fashioned retorts requiring a large amount of labor, zinc producers are generally concerned about the increasingly pressing problem of costs. Most likely remedy: further replacement of outmoded facilities with newer electrolytic, electrothermic or vertical retort methods. A few brand-new ideas in zinc smelting are in the well-shrouded background, but none is believed to be near commercial realization. Chemical industry's stake in the proposed plant: over 300 tons per day of sulfuric acid from the sulfur dioxide in the smelter gases.

* * CI * *

Disho, a new light-duty synthetic detergent product promoted exclusively for dishwashing and selling competitively with Vel and Dreft, has just been introduced in the Dayton, Ohio, market by soapmakers M. Werk Co., Cincinnati. It will move into other areas after the test run.

Service under conditions of high temperature, abrasion and/or

corrosion is given by ceramic coatings for metals developed by Technical Enterprises, Inc., New York. Tests under way for several months in Eastern public utility and other plants indicate that the service life of alloy steels, in superheater supports and similar applications, is doubled at over 2,000 deg. F. Such a coating can be applied to any metal melting above 1,800 deg. F. by conventional techniques of spraying or dipping the sand-blasted metal. It is then air-dried and fired at a temperature high enough to cause reaction between the coating and the metal surface.

* * CI * *

Dimerized linoleic acid, first announced by Emery Industries about two years ago (CI, Oct. 1947, p. 606), is now commercially available at low cost from Emery's new dimerization plant. A potential large-scale use has just been developed by Armour Research Foundation: substitution for palm oil, 7,500 tons of which are imported yearly for use in hot-dip tinning baths.

Stauffer Chemical Co. has contracted to sell the entire output of American Smelting & Refining Co.'s $1.5-million, 100-tons-per-day sulfuric acid plant now being constructed to operate in conjunction with AS&R's Tacoma smelter.

* * CI * *

Airkem Inc., which markets its air conditioner, Airkem, in the commercial and industrial fields and supplies Seeman Bros. with the formulation in bulk for packaging as the well-known Air-wick, is test-marketing an aerosol air conditioner filled with the same ingredients. Called Airkem Mist, it will be distributed to the industrial, institutional and commercial fields (doctors' and dentists' offices, schools, meeting halls, offices, hotels, etc.) through the company's regional distributors and jobbers. Price is $1.79 for the 12-oz. container, but most sales will be in case lots since it will not be an over-the-counter item. Bridgeport Brass Co. is filling for the trial.

Big news in silicones: Plaskon Division of Libbey-Owens-Ford Glass Company will soon announce availability of its new alkyl trichlorosilanes (CI, Mar. 1949, p. 371). The company has developed a low cost process which may permit an ultimate price in the neighborhood of 50¢ a lb. Hydrolysis of the silanes will give silicones, currently priced at $3-6 a lb.

Contrary to information on this page last month, Department of Justice says it has no monopoly suit pending against Dow on Magnesium.

* * CI * *

Here and There:

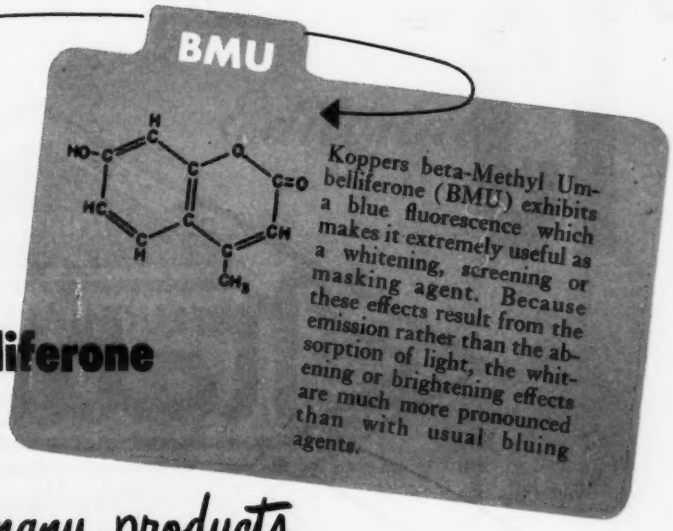
Synthetic detergent growth has cut domestic demand for tallow, basic material for soap, by 30 per cent. Supply and demand law shows up in tallow price: down almost 50 per cent from a year ago....A Dow Corning patent (U. S. No. 2,474,444) describes the preparation of alkyl-substituted silicon compounds by the reaction of molten metallic sodium with a tetra-alkyl orthosilicate and a dialkyl sulfate.

The Editors

Koppers

beta-Methyl Umbelliferone

increases whiteness and brightness of many products


BMU
Koppers beta-Methyl Umbelliferone (BMU) exhibits a blue fluorescence which makes it extremely useful as a whitening, screening or masking agent. Because these effects result from the emission rather than the absorption of light, the whitening or brightening effects are much more pronounced than with usual bluing agents.

SOAP PRODUCTS—Use of BMU overcomes slight yellow discoloration of soap, gives desirable blue fluorescence to the bubbles, and lends a whitening effect to washed fabrics.

SUNTAN PREPARATIONS—Koppers BMU has been recommended for use as a screening agent against ultraviolet light in suntan lotions, oils, creams, and similar protective products.

TEXTILES—Koppers BMU has been used in finishing textiles to improve the whiteness of new white goods or the brightness of certain colored fabrics.

PAPER AND PAPER COATING COMPOSITIONS—The use of BMU is suggested as a whitening agent for paper products and certain coating compositions.

OPTICAL SCREENS AND FILTERS—Koppers BMU has been used in the preparation of film for ultraviolet light filters.

FLUORESCENT INDICATORS AND TRACERS—BMU is useful as an indicator in volumetric analysis, and as a marking agent for tracing materials and detecting adulteration.

DYESTUFFS—BMU is suggested as an intermediate for the production of specialty dyestuffs.

PHARMACEUTICALS—The methyl ether of BMU has activity as a hemostatic agent and may find medicinal uses in shortening blood clotting time.

TECHNICAL INFORMATION

Empirical Formula	$C_{10}H_8O_3$
Form	White to light yellow solid
Melting Point	189.0°C.

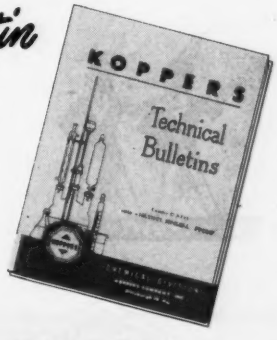
Solubility

Solvent	Temperature	Solubility*
Water	25° C.	0.017
Sodium Carbonate (aq. 5% soln.)	25° C.	2.5
Sodium Bicarbonate (aq. 5% soln.)	25° C.	0.02
Sodium Phosphate (aq. 6.5% soln.)	25° C.	2.5
Borax (aq. 3.3% soln.)	25° C.	0.05
Ethanol	80° C.	20
	25° C.	3.7
Benzene	25° C.	0.027
White Mineral Oil	25° C.	0.001

*Percent by weight, or by parts of BMU per 100 parts of solution.

Send for this bulletin

Properties, reactions and proposed uses of Koppers BMU are described in detail in Bulletin C-9-111. Write for your copy.



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NATURAL PRODUCTS REFINING COMPANY
JERSEY CITY, NEW JERSEY

BIGNESS IN THE CHEMICAL INDUSTRY

by ***ROBERT L. TAYLOR, Editor***

How has the bigness of a few companies affected the chemical industry? Has the influence of the big fellows been good or bad? Has it deterred or has it helped overall progress and achievement in the industry? Has the public gained or lost?

These are questions which in the light of the current government drive against bigness in business, or—as the Department of Justice prefers to call it—concentration of industrial power, deserve a closer look than most of us may have given them.

Along with the tobacco industry, against whose three largest producers the bigness-is-badness philosophy was first sustained by the Supreme Court in 1945, the chemical, petroleum, steel and non-ferrous metals industries have been mentioned as possible targets for future attacks.

Memories of the German dye trust and its tactics both pre- and post-World War I in keeping the struggling American organic chemical industry under its boot-heel are still too fresh in the minds of chemical people for many of them to argue that bigness cannot be bad. Few will deny that the restrictive efforts of the dominant German chemical makers were not highly successful in those early days, and that they certainly did not make for progress—at least in America.

But to charge that bigness in business is inherently bad, as does the Justice Department, is quite another matter. Not only does it fail to comprehend the nature and mechanism of modern industrial society, but it completely ignores the records of such industries as chemicals, in which large economic units have played such important roles in the general progress.

It is difficult to conceive of any smaller company sustaining Dow's long years of losses in magnesium before realizing a cent of profit on the product. Or underwriting ten years of research by 250 chemists and engineers and their assistants to develop a nylon, as did Du Pont.

Many persons—most loudly of all certain government officials—recently have emphasized the need for sources other than petroleum for our liquid fuel supplies of the future. Yet the magnitude of this project is so great, and the promise of return so uncertain, that only a handful of the largest oil companies have been financially able to tackle it, and even then only with some trepidation.

The simple fact is that we are in an age of *big* accomplishments. We cannot help ourselves. Our social and economic order today *demands* big accomplishments, especially in the United States. And big accomplishments require *big* resources, *big* organizations, concentration of power in *big* units. If in matters of technology and production industry does not—or is not permitted to—meet this challenge, the only alternative is for government to do it, just as we have seen threatened in steel and synthetic fuels.

The question then, it seems to us, is whether the American people prefer bigness that has become big via the proving ground of the market place, where efficiency and value are the yardsticks, or bigness by fiat, where the principal claim to the position is political power.

Let it be clear that in arguing for bigness we do not condone misuse of the power that unavoidably comes with bigness. Because the power is there a sharper eye must be kept on the big fellow than on the little fellow. But to do away with big business because its bigness is a potential menace is a primitive solution. We need the big fellows. We need them especially in the chemical and other highly evolutionary industries, for just across the still-expanding frontiers of science lie many more buried treasures which will require large-scale resources to extract them.

If there are abuses of industrial power by any company or group of companies, in the chemical industry or any other industry, let the government take steps to stop them. An attack on bigness as such, however, or on "economic power," will solve nothing and will strike at the very heart of our strength and progress as a nation. As intelligent citizens, and with our first-hand understanding of how modern industry works, we who are engaged in the business of chemistry can do much to dispel the misunderstanding that is so widespread on this score today.

A quality product in a "non-skid" bag.

SPECIFICATIONS OF PITTSBURGH PHTHALIC ANHYDRIDE

Property	Sales Specifications
General Appearance	Clean, White Flakes
Molten Color*	55 Hazen max.
Freezing Point	130.5° C. min.
Benzene Solubility	Clear
Maleic Anhydride Content†	0.25%
Sediment	Sediment Free, Solid Melt

**In melting the sample, avoid overheating*
†Permanganate Titration

Pittsburgh Phthalic Anhydride is produced at one location in a series of integrated processing steps, beginning with preparation and coking of its own high-grade coal.

Here on its "Isle of Chemicals", complete control of manufacture with no dependence on outside raw materials enables Pittsburgh Coke & Chemical Company to maintain high standards of quality demanded of the finished product by industry.

Pittsburgh Phthalic comes in free-flowing, clean, white flakes, free from impurities that cause coloring or premature gelling and foaming. It has a uniformly low maleic anhydride content. It is packed in sturdy, moisture-proof, 5-ply bags that provide adequate protection and whose flat, rough "non-skid" exteriors prevent sliding when stacked.

You'll find Pittsburgh Coke & Chemical Company a dependable, economical source for Phthalic Anhydride. Please address inquiries to:

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What's new

THE BROTHERS DUPONT*: The darts are getting sharper.

IS DU PONT TOO BIG?

The courts will attempt to decide, in what promises to be one of the biggest antitrust battles of all time.

THE Department of Justice last month wheeled out the heavy artillery it had been amassing and fired the first salvo in what Attorney General Tom Clark called "the breaking up of the largest single concentration of industrial power in the United States."

Targets of the attack were big E. I. du Pont de Nemours & Co., General Motors Corp., United States Rubber Co., Christiana Securities Co. and Delaware Realty & Investment Corp., as well as the three du Pont brothers, Pierre, Irénée, and Lammot, and some hundred or so of their relatives.

The Accused . . .

The Attorney General's charges run almost the gamut from malicious mischief to genocide. The du Pont Company and members of the du Pont family, he thundered, by virtue of their holdings of 23 per cent of the voting stock of General Motors and 17 per cent of U. S. Rubber, control the selection of officers and directors and formation of policies in both companies. This control, Mr. Clark maintains has been utilized in the following ways, which are illegal under the Sherman and Clayton Acts:

- Du Pont shuts out other suppliers by requiring that du Pont, General Motors and U. S. Rubber buy from each other, under a system of preferential prices and secret rebates. Moreover, these preferential agreements have "subsidized" the expansion of all three companies.
- Du Pont has expanded its own facilities so as to be able to supply the bulk of chemical and related products required by the other two companies and has required that they in turn expand along lines that will create additional assured markets for du Pont.
- Du Pont, General Motors, and U. S. Rubber have each induced their outside suppliers to make reciprocal purchases from all three companies; have each made with the other two, exclusive or preferential exchanges of patents, technical data, and trade information; and have eliminated competition among themselves by dividing fields of manufacture.

Summarizing the charges, as well as some of the Government philosophy behind them, Assistant Attorney General Herbert A. Bergson said: "The concentration of economic power at which this suit is aimed was achieved through the acquisition of minority stock interest sufficient to secure control. The dominating market position occupied by each of the manufacturers involved was achieved through an illegal system of intercompany preferences in buying from each other in closed, and hence guaranteed, markets, and by the reciprocal subsidization of all three companies through price preference and secret rebates."

. . . Fights Back

Alert and braced for the attack, du Pont fired back almost immediately. In a letter to du Pont Company stockholders, employes and customers, Crawford H. Greenewalt, company president and son-in-law of Irénée, emphatically denied that the transactions between the three companies had been illegal or improper, cited evidence to refute some of the Government charges, promised that the rest would be answered fully in court. Snapped he, "We can only conclude that this suit arises out of a determination by the Department of Justice to attack bigness in business as such. It is apparent that the Department of Justice is proceeding along this path with no real understanding of the nature of the American economy and with no realization of the consequences to that economy of a successful attack upon bigness in business . . . I assure you we will fight this unjustified attack with all possible vigor."

A week later the Inter-Plant Association of Independent Unions, a collective bargaining agency representing 35,000 du Pont employes in eight plants, urged its members to send a "deluge" of letters to

* Irénée, Pierre, Lammot, under portrait of their father who was grandson of Eleuthère Irénée du Pont, company founder. Each brother has held the office of president of the du Pont Company: Pierre 1909-1919, Irénée 1919-1926, Lammot 1926-1940. Lammot is now chairman of the board.

the Department of Justice and their congressmen asking the Government to drop "this unfair antitrust suit against the du Pont Company." Reaction to the Greenewalt message has been large and overwhelmingly encouraging, a du Pont spokesman reports. "It has added to our determination to fight this thing through."

A Scene Revived

To oldsters in the chemical and explosives business the scene revived memories of forty years ago. Du Pont and the Justice Department made headlines then when the du Pont Company, which since the Civil War had acquired and dissolved—or was in the process of so doing—133 corporations, was charged with having quite effectively stifled competition in the explosives industry. The ensuing four-year legal battle ended on June 12, 1911, when the court declared

SON-IN-LAW GREENEWALT: We will fight with all possible vigor.

the defendants in violation of the Sherman Act and ordered dissolution of the old Gunpowder Trade Association and the splitting off from du Pont of what are now the Hercules Powder Co. and Atlas Powder Co.

Then, as now, Pierre du Pont was one of the individuals named among the defendants. If he follows the present trial closely, however, he will doubtless find that the court's interpretation of the Sherman Act has changed considerably since he shouldered the main burden of the defense in the earlier litigation.

The Sherman Act

The Sherman Act is probably one of the most general statutes ever written, with an adaptability which Chief Justice Charles Evans Hughes once characterized as "appropriate to a charter of freedom." This appropriateness, however, makes the law extremely difficult to operate under. Court interpretations of its meaning shift from year to year.

Essentially, the act's prohibitions can be reduced to two: Section 1 declares contracts and combinations in restraint of interstate or foreign commerce to be illegal; Section 2 makes criminal the monopolization of (or attempts of combinations to monopolize) any part of such commerce. The Clayton Act, an omnibus measure, among other things specifically prohibits four practices where the effect would be a substantial lessening of competition: price discrimination; "exclusive dealing" contracts; acquisition by a corporation of a competitor's shares; and interlocking directorships between certain competing corporations.

In contrast with the classical interpretation of the antitrust statutes, wherein "mere size . . . or the existence of unexerted power" does not make an offense,* the present case will in all likelihood be influenced by what is known as the new "big three" or "big four" interpretation, even though it does not fall specifically in that category. This interpretation holds, as enunciated in the "big three" tobacco case in 1945, that where a combination of three or four companies has power to exclude competitors from the market, and evidence intent to do so if necessary, "actual exclusion of competitors" is not necessary to the crime of monopolization.

The New Target: Power

Assistant Attorney General Bergson has in fact stated that "today the major antitrust problem is the unlawful concentration of economic power in industries controlled by a few large companies—the big three's and big four's . . . It is against these concentrations of monopoly power that the Antitrust Division is now directing its main activities. This enforcement program consists of a direct frontal attack upon economic concentration and monopoly power, and strikes at restraints of trade that foster the development of that power."

The Antitrust Division chief has already said that he considers the du Pont case as falling in the latter category—a restraint of trade that fosters economic power. This raises the question: Is the du Pont case a prelude to a "big three" case in the chemical industry?

At least one disciple of the "New Sherman Act," as the big three interpretation has been called, Professor Eugene Rostow of the Yale Law School, thinks it should be. "Most of the basic areas of the economy are organized along lines which broadly resemble the pattern disapproved in the tobacco case," he declares. If, in these cases, the offense is monopoly power, "the only punishment which fits the crime is directly to reduce the monopolistic size of the business units which have monopolistic power." Rostow's vision of industries that may be dominated by "monopolistic units" includes—in addition to chemicals—steel, petroleum, nonferrous metals, motion pictures, and electrical equipment.

More Than a Clue

The du Pont case is thus one that will be watched closely by large companies in all industries. It should provide more than a clue to Antitrust Division tactics in the Division's announced campaign against bigness in industry.

On the surface, some of the charges against du Pont have a distinct political cast; others, such as the contention that the three companies have grown fat by feeding upon themselves, involve a considerable stretch of economic imagination. But the question that must be decided by the court is: Have du Pont and members of the du Pont family been breaking the law? The facts in the case should be relatively easy to obtain and agree upon. The interpretation that is put on those facts, and, indeed, on the law itself, is likely to be the subject of many and bitter arguments. The answer of the court, when it comes, is more likely to be based on politico-economic philosophy than on statutory interpretation.

MORE ISOTOPES

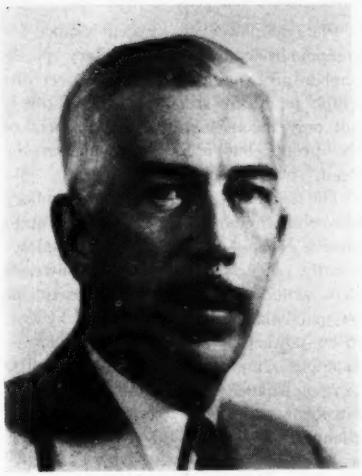
FOLLOWING the recommendation of the National Research Council, the Isotopes Division of the Atomic Energy Commission will allocate cyclotron-produced radioisotopes.

The great number of requests for these isotopes make it impossible for any one cyclotron laboratory to satisfy the demand without seriously interfering with its research programs. Consequently Carbide and Carbon Chemicals Corp., operator of the Oak Ridge National Laboratory for the Commission, will purchase cyclotron time from various institutions operating such machines. Initial arrangements have such machines. Processing of the irradiated targets will be carried out at Oak Ridge in present facilities.

Use of the cyclotron will permit production and distribution of a significant number of radioisotopes which either cannot be produced by the uranium chain reacting pile or which do not meet certain requirements which are obligatory for many applications.

Initial distribution will be limited to those isotopes having half-lives over thirty days, such as 43-day beryllium 7, 3-year sodium 22, 44-day iron 59, 4-year iron 55, 250-day zinc 65, 90-day arsenic 63 and 56-day iodine 125.

* United States Steel case, 1920.



I. P. MACAULEY: Foot in the door.

REYNOLDS CHEMICALS

Reynolds Metals Co., aluminum manufacturer, sets up Chemical Division.

FOLLOWING a path that many other previously non-chemical companies have trod, Reynolds Metals Co. has recognized the growing importance of chemicals in its markets, has set up a Chemical Division to handle them. The new division, with headquarters at 19 East 47th St., New York City, will be headed up by I. P. Macauley, vice-president, who will also continue to head up Reynolds' aluminum pigment division.

In Reynolds' case the step does not represent a diversification: two of the three chemicals the new division will handle—hydrated alumina and calcined alumina—have been produced all along as intermediates for aluminum manufacture; and the third—R. R. aluminum—is simply a high-purity particle form of aluminum used largely for deoxidizing metals.

Fro many years Reynolds used all the alumina it could make for conversion into aluminum. Production finally caught up with falling demand and the company had alumina to sell.

Exploring New Markets

Many markets for alumina already exist: dye mordant, waterproofing textiles, printing and lithographing inks, cements, abrasives, and a host of others. But Reynolds expects to intensify application research at its Glen Cove, L. I., laboratories and expand its present small-scale chemical research in an effort to develop new products in line with its manufacturing operations.

Not merely an organizational change nor a reshuffling of duties, the new division will push market development and sales, put Reynolds' foot in chemical industry's door.

OPTICAL PUNCH CARD

Electronic brain searches literature with combination of microfilm and punch-card technique.

NOT ONLY can a 2,000-foot reel of 35 mm. film condense into one-fourth of a cubic foot the information normally contained in 1,100 cubic feet of file space, but now the new Microfilm Rapid Selector, recently developed by the U. S. Departments of Commerce and Agriculture, obtains all the items under any one of 10,000,000 possible coded subjects in a matter of minutes. The machine stores vast amounts of scientific information in its system, automatically "pores" over it, selects what is sought after by its operator, and then hands him copies of what he wants.

The device was developed from principles originated before the war by Dr. Vannevar Bush, then at the Massachusetts Institute of Technology. The Office of Technical Services of the United States Department of Commerce, under the direction of John C. Green, appropriated more than $75,000 for the perfection of the machine, which was developed by Engineering Research Associates, St. Paul, Minn., under the supervision of Ralph R. Shaw, Librarian of the Department of Agriculture. This firm, most of whose work has been in the field of electronic controls and computers, was organized in 1946 by a group of Navy reserve officers, most of whom had worked together during the war. John A. Parker, president, was closing his glider manufacturing plant in St. Paul about the time ERA was being organized; and this plant now constitutes ERA's main plant and laboratories. Captain Howard Engstrom is director of research. Present personnel totals about 550, including about 75 professional scientists. About 40 are in a branch laboratory that has been established in Arlington, Va.

Microfilming has been generally limited to "dead" material because of the tedious task of obtaining individual items. With the Rapid Selector, microfilming becomes a "live" system which can be used for such active filing as current correspondence or even personnel files including a photograph of the worker. The device also provides a faster and more positive means of getting printed material from the scientific literature and also provides a new means for the organization of knowledge. The limits set by the physical problems of filing systems vanish and material can be organized according to ideas rather than storage limits.

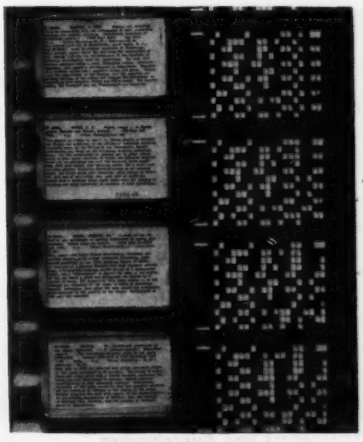
Photoelectric Scanner

The principle involved is much like the familiar door-opening photo-cell devices. The Rapid Selector scans the code patterns of light and dark accompanying each film frame, "looking" for a particular pattern to match the master key card inserted in the machine. When the two coincide a flash lamp is fired and the frame passing through the scanning area at that instant is photographed.

When a complete reel has passed through the machine, the researcher has a complete and accurate bibliography of the subject in a minimum of time. A repeating flash lamp is used, similar to those increasingly in favor by photographers because of its brilliant instantaneous beam which lasts only two-millionths of a second, thereby making a clear photograph of each item without slowing down the film which is moving at a rate of 360 feet per minute. A 2000-foot reel, containing about 500,000 items is scanned at a rate approaching 100,000 items a minute.

The original material can vary in size from library cards up to pages from reports or blueprints. It is photographed, along with the code pattern, onto 35 mm. microfilm by a modified standard commercial microfilm camera. A number of code patterns can be placed on the same frame if the material falls into several subject classifications. In use, the researcher selects the proper code number from a code index, dials the number on a punch and thus obtains a master key card. With the key card in the Selector, the mechanism scans the film, automatically selects the desired frames, and copies them on a separate film. The developing and printing of this strip of film can be done by ordinary darkroom techniques, by the use of a V-mail printer, or by a recent Kodak development which will turn out a finished print in 10 to 12 seconds.

As an example of how the new machine



MICROFILM FRAME: Ten million variations.

might save time, an estimate has been made indicating that it would take the Rapid Selector only about 15 minutes to review all the entries that have appeared over the last 30 years in *Chemical Abstracts,* presupposing, of course, that the abstracts had first been transferred to properly coded microfilm.

ERA estimates that the Selector could be duplicated for about $50,000. The firm is inviting requests for bids on custom-built models.

Junior Model Coming

The principles developed can be applied to simpler machines. For example, Engineering Research Associates is considering the development of a "junior model" which would begin to pay off when the items involved were as few as 5,000 or 10,000. Simpler coding and scanning devices could be used and the machine would merely stop the microfilm so that each frame containing the selected code could be viewed by the operator.

PLOSOPHORES, ETC.

Studies at Arthur D. Little, Inc., put constitution of organic explosives on scientific basis.

OFFHAND, there doesn't seem to be too much in common between the ability of a dyestuff to dye and of an explosive to explode. But dyestuffs and explosives are often chemically similar, and for that reason it isn't too surprising that both of these types of organic compounds are susceptible to a similar constitutional approach.

Many years ago a dyestuff chemist, Witt, developed the theory that certain groups of atoms in a dyestuff molecule conferred color. These he called chromophores. Other groups, he asserted, although they didn't give rise to color, subtly affected the color caused by the chromophores. These groups he called auxochromes.

Now two scientists at Arthur D. Little, Inc., Warren Lothrop and Richard Handrick, writing in *Chemical Reviews,* have developed an analogous theory of explosives. They contend that application of the theory will enable a chemist to predict, within limits, the power of an explosive before he has synthesized it; and they admit the possibility, by application of certain general principles, of preparing more powerful explosives than have hitherto been available. They concerned themselves, of course, only with organic explosives of the TNT type—not atomic energy.

Plosophores and Auxochromes

Just as certain groups confer color on a molecule, so do other groups confer explosibility. The primary "plosophores," as they are called, are nitrate ester, aromatic and aliphatic nitro, and nitramine. Secondary (generally less powerful) plosophores include azo, azide, nitroso, peroxide, ozonide, chlorate, perchlorate, ethynyl, and fulminate.

EXPLOSION: Plosophores, oxygen balance at work.

Other groupings of atoms, such as hydroxyl, ether, amine, carbonyl, halogen, etc., are not explosive, but they may either aid or hinder the activity of the plosophores. These the authors call "auxoploses." Most of them are included in the molecule not by design, but for ease in synthesis; on the whole, they lower the power and brisance of the explosion as measured by the Trauzl lead block test.

Oxygen Balance

Although any of the primary plosophores, or any combination of them, is equally effective, that doesn't mean that one nitro compound, for example, is as good an explosive as another. The value of a particular compound depends to a great extent on its oxygen balance; and the authors have restudied this factor in terms of their new concept.

Oxygen balance of a compound is the percentage of additional oxygen necessary to convert the carbon and hydrogen to carbon dioxide and water. If there is exactly enough oxygen contained in the compound, the balance is zero; if there is a deficiency, the balance negative; excess, a positive balance.

If one plots the power of aromatic nitro compounds (for example)—which can be measured by the standard lead-block or ballistic mortar tests—against their negative oxygen balance, the values fall close to a straight line which rises to a maximum value of 170 (TNT = 100) when the balance is zero. A much steeper line declining from zero balance to positive values is obtained for the relatively few explosives that contain excess oxygen.

Plots of power vs. oxygen balance for compounds containing secondary plosophores give points falling all over the graph paper. A secondary plosophore is not only inconsistent with the others of the group, but is even inconsistent by itself.

The same plot—this time of primary plosophoric compounds containing auxoplosive groups—shows that the auxoploses usually render a compound less powerful than would be expected at a particular oxygen balance. Trinitrobenzaldehyde is more powerful than trinitrotoluene, for example, simply because it has a better oxygen balance; it's not as good as trinitrobenzene, whose oxygen balance is about the same.

Room for Study

It is possible—since the figures available are not highly accurate nor complete—that maximum power may be obtained at a slightly negative oxygen balance rather than at zero. Relatively few of the compounds studied fall in the highly interesting —20 to 0 balance range; and it is in this range that progress may conceivably be made.

TUNG OIL TIGHT

Low stocks of tung oil being depleted as war in China stops imports.

IF IT IS of any solace to Chiang Kai-shek, the communists in China are putting the squeeze on American consumers of tung oil (China wood oil) as well as on the Nationalist Government, and they can't move their base of operations. With imports from this main source stopped, manufacturers who use this fast-drying oil for paints, varnishes, printing inks, linoleum and oil cloth see available stocks running low. Moreover, the recently increased tempo of the war in China may soon expose the bottom of the barrel.

Combined stocks of domestic and imported oil were about 47 million pounds on January 1, about 9 million more than a year ago. Imports for the first quarter, however, were only 23 million pounds, 18 million less than the comparable period last year. Stocks built up during the slack consuming season to about 55.4 million pounds by the end of March, but by the end of May they were estimated at as low as 30 million.

Little relief can be expected from domestic producers despite the large plantings that have been made in the Gulf Coast states over the past several years. Domestic production of tung nuts in 1948 is estimated to have been a record 67 thousand tons compared with 53 thousand in 1947, and oil production was 17 million pounds. Domestic producers are virtually

out of the market now, and oil from the new crop, while it probably will exceed 20 million pounds, will not hit the market before late December at the earliest. The joker is that the heavy consuming season is from August to November.

Even if this were available, it wouldn't go very far. Last year about 112 million pounds of tung were used for drying oil purposes. Normal consumption runs from six to fifteen million pounds a month, depending on the season and the amount available. If anywhere near the twelve to fifteen million pounds per month consumption that is usual for the coming months is to be maintained, it is obvious that what is available won't last long.

In the absence of tung, consumers will have to turn to other drying oils. Linseed oil, which was expected to depress the price of tung because of substantial reductions resulting from the lower support price for flaxseed, will probably get a good share of the business. Some varnish formulations, however, require tung oil; and manufacturers will have to use whatever tung they can get as they wait for the new domestic oil and pray that the Chinese trade resumes.

CUSTOM CANNER

Unique organization's function in chemical business is filling aerosol containers for specialties companies.

CUSTOM PACKAGING is not new in the chemical industry, but custom canning in aerosol containers is both new and important. Products that can be dispensed by the popular aerosol finger-touch technique are cutting into sales of conventionally packaged chemical specialties. Consequently, manufacturers are looking to this type of dispenser—and to the specialist who can "can" their product—to hold their share of business.

Continental Filling Corp., Danville, Ill., is both typical of the companies in this middle-man canning business and different from them. It is typical in that its first products were insecticides, and that it has since expanded its line to include deodorants, plastic coatings, fire extinguishers, moth proofers, waxes, germicides, and hair lacquers; different in that it eschews marketing its own brand of aerosols. This latter policy gives it a big advantage over companies that sell their own aerosols as well as the filling service, and its boast, "We don't compete with our customers," keeps its Danville plant humming.

Low Pressure Only

Unlike some fillers who cut their teeth on high-pressure aerosols before turning to the "beer can" type dispenser, Continental has never filled anything but low-pressure aerosols except in the laboratory. The firm was incorporated in Illinois about two and a half years ago with C. F. Carter as president and H. E. "Pete" Peterson as vice-president and general manager.

They form a good team since Peterson knows aerosols—he spent ten years as a chemist for Continental Can Co. and numbered among his duties promotion of the aerosol package—and Carter, custom filling machinery—he's been in the game for many years, and at the request of Continental Can, designed filling equipment for low-pressure aerosols. Danville was picked as the site for the plant because of its central location and because Carter already had his staff there.

Aerosols began rolling off the line in Danville about a year and a half ago—just about the time the low-pressure gadgets began to make a dent in the mass market represented by housewives eager to try something new in carrying out old chores. Continental has helped make this dent a large and permanent one.

The company has brought new ideas to the field and scored a significantly large number of "firsts." In addition to having the first plant built for low-pressure units, it pioneered the so-called two-stage filling method. This involves adding propellant and active ingredients separately, a procedure that provides far greater versatility in scheduling than pre-mixing the gas and active ingredients. Among the earliest with air deodorants, it showed the way with an automobile and furniture wax (*CI, July 1949, p. 78*) and its bactericidal formulation is now being marketed in the recently introduced Microbomb. Although the company claims to have done the first experimental work with paints, its development work is not yet far enough along to justify putting its customers in that field. It does have plans for paint products as well as insect repellents, cosmetics, fungicides, pharmaceuticals, glass cleaners, foods, dyes and dog repellents.

Despite its research department's constant search for new prospects for packaging in the low-pressure dispenser, the company has not been tempted to cash in on especially "hot" items with fliers into the consumer field. It is content to develop a product, do all the mixing of ingredients from the basic substances—it will start with straight DDT powder in the case of an insecticide, for example—and then turn the packaged formulation over to the customer for marketing.

Novel Role Pays Off

This novel role in the job of turning bulk chemicals into consumer products has its advantages, especially for a new company. For one thing, it doesn't have to develop sales outlets nor a large sales force. Moreover, it does not have to maintain any inventory. Continental has none with the exception of the items it controls such as its chemical deodorant (called Meelium) and wax, and a small stock of cans to accommodate rush orders. In taking its profit on the fee it charges for filling, it is spared the price cutting fears unfortunately characteristic of entrants into new fields.

Continental's service charge for filling aerosols is based on the product being packaged as well as the quantity. It is no small business, for some months well over a quarter of a million dollars' worth of materials are deposited at its ten-car railroad siding, and products representing about a million and a half dollars in retail sales value are hauled away.

PETERSON AND CARTER: New highs in low pressure.

NEW CENTURY, NEW PFIZER

Entering into its second hundred years, Charles Pfizer & Co., Inc., is expanding rapidly, proliferating in more directions than ever before.

IN TEN YEARS Charles Pfizer & Co. has moved the decimal point one place to the right: It jumped its profits from slightly less than $1 million (1939) to slightly less than $10 million (1948) while sales rose from $6.2 million to $47.8 million. It has thus rounded out its first century with an eventful last decade, marked by rapid expansion of sales and plant, and introduction of new products.

Small Beginnings

In 1848 two distant cousins from the same town in Germany, Charles Pfizer and Charles F. Erhart, emigrated to Brooklyn. There, in 1849, they formed a partnership to produce fine chemicals. The firm was practically a manufacturing apothecary, for its first products were such pharmaceutical items as santonin, camphor, mercurials, and iodine preparations.

Growing gradually, the company undertook research in 1914 to investigate the possibility of producing citric acid by fermentation. Slow but sure progress led to a pilot plant in 1919 and a large commercial plant in 1923. During World War I, meanwhile, the firm fulfilled 85 Government contracts for several items.

Gluconic acid by fermentation was introduced in 1929 and vitamin C followed in 1936. Other products, including vitamins, tartrates, and various derivatives were introduced from time to time.

When, early in World War II, penicillin was rediscovered as a potent antibiotic, Pfizer, with its long background of fermentation know-how, was in a position to do a quick research and development job leading to early production. A key producer of penicillin from the first, the company has also undertaken production of streptomycin and dihydrostreptomycin and research on new antibiotics.

Widened Management

Until recently ownership and management were in the hands of the Pfizer and Erhart families and their early associates. Charles Pfizer was active head of the company from its founding until 1900, when it was incorporated. The Pfizer and Erhart sons then took over the reins until they died eight years ago. Ownership has since been widened, and now the majority of the stock is publicly held by some 7,000 shareholders.

The third generation of management is headed up by John L. Smith, who joined the firm as a laboratory assistant in 1906. Chemically trained, he first sparked the citric acid project, moved up the ranks to the presidency in 1945. Known in chemical circles as president of Pfizer, he is known to Brooklynites and sportswriters as part owner of the Dodgers.

While these two interests seem unrelated, it would appear that some surplus Ebbets Field enthusiasm has spilled over into his firm management of Pfizer. The company plowed back $17 million of profits into plant expansion in the last six years, $5 million of it last year alone. Plans call for an additional $4 million expenditure this year.

Groton, Maywood, Terre Haute

Most of that $4 million will be spent at Groton, Conn., and Terre Haute, Ind.

Late in 1946 Pfizer bought from the Government a surplus submarine plant at Groton. Existing buildings were converted to chemical manufacture, and additional ones—a power plant, a 4-story citric acid building, an oxalic acid plant, and a fine chemicals unit—were built. Future plans envision large-scale production of antibiotics and other fermentation products, and a multi-purpose synthetic organic plant. Groton will be the center of the company's future manufacturing development.

In 1947 Pfizer bought Citro Chemical Co., Maywood, N. J., manufacturer of caffeine, acetphenetidine and acetanilide. Raw material supply difficulties were encountered last year, but operations are now approaching normal.

Also in 1947 the company leased for 20 years the Government's chemical warfare unit at Terre Haute, Ind. Streptomycin, animal protein factor and vitamin B_{12} are now being produced there.

Domestic and Export

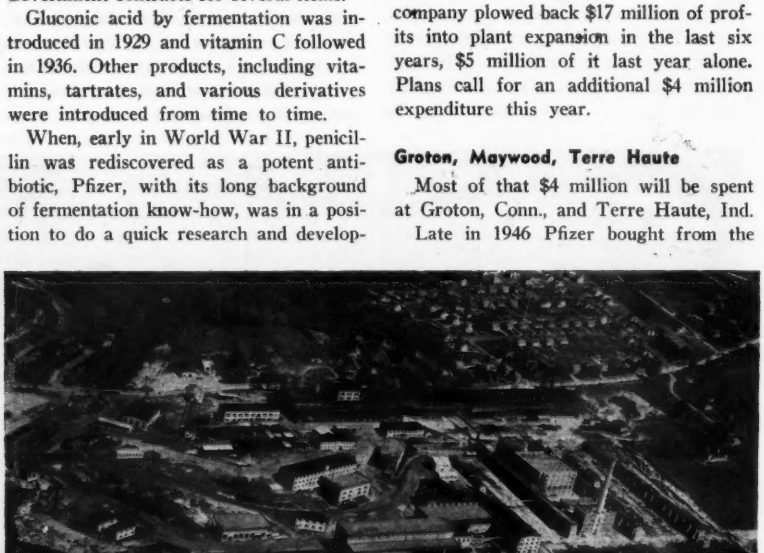
In spite of its size and diversity of products, Pfizer is unknown to the average man in the street: Only one product, an ascorbic acid-citric acid-lactose mixture to prevent browning of frozen fruit, reaches the public under the Pfizer label. All other products are sold industrially or to pharmaceutical firms for repackaging. Pfizer sells antibiotics abroad under its own label. Like its competitor, Merck, incidentally (*CI, July 1949, p. 34*), Pfizer likely finds an increasing proportion of its sales in the export field.

Many Customers

It is easy to think of Pfizer as being neck-deep in food and pharmaceuticals. While there is much merit in this impression, actually Pfizer products serve a variety of industries; and the current trend is towards increasing emphasis on the chemical, textile, and plastics fields.

Gluconic acid, for example, long a pharmaceutical staple, is now being promoted to the textile field as a mild, nondestructive acid and sequestering agent for various textile treatments. Aconitic acid is offered as an intermediate for sulfonated wetting agents and plasticizers and as a component of alkyds. Itaconic acid, made directly by fermentation, is being investigated as a monomer for hard, high-clarity copolymers; and a resinous plasticizer based on dibutyl itaconate is in the research stage.

The company has been delving into citrate esters as vinyl chloride plasticizers and will shortly announce a new one, acetyl trihexyl citrate, that is characterized by low volatility, easy workability, and high stability. Now in the pilot plant, it will be marketed soon, hopes Pfizer,



PFIZER'S GROTON PLANT: A dark horse in the stable.

JOHN L. SMITH: He rides a fast pace.

at a competitive price level. Triethyl and tributyl citrate, and their acetyl derivatives, are already commercial products.

Feedstuffs, Antibiotics

Pfizer's traditional fields, meanwhile, are not lying fallow. Just last month the company announced animal protein factor under the name Bi-Con APF-6, a biological concentrate containing 6 mg./lb. of vitamin B_{12} and other growth factors, for livestock and poultry feed enrichment. It replaces in part such animal protein sources as fish and meat scraps. APF is the first of a series of feedstuff products that the company will promote.

The company is also isolating B_{12} and is offering the highly purified anti-anemia vitamin for pharmaceutical use; and it is readying the new antibiotic neomycin (*CI Newsletter, April 1949*) for clinical evaluation.

Pfizer research workers recently reported latest clinical results with neomycin to the New York Academy of Sciences. Their tests indicate that neomycin is active against both Gram-negative and Gram-positive organisms and streptomycin-resistant tuberculosis strains.

Lower antibiotic prices and consequent lower profit margins showed up in the company's first-quarter statement this year: $2,557,000 compared with $2,921,000 last year. Profits from new and expanded plants should, however, reverse that trend before long.

Increasing use of chemical synthesis is evident, although Pfizer will still depend on "bugs," in its varied fermentation processes, to do much of its work. There is still opportunity for new products, it believes, right in the field it knows best. While the fermentation horse has carried the company far, chemical synthesis is the dark horse in the stable.

STEEL WITHOUT COAL

Pluro, Inc., develops a process for hydrogen reduction of powdered iron ore.

STEEL and coal have always been as inseparable as Damon and Pythias. The trouble is, iron ore and coal deposits aren't always found together; and ore found alone—as in Brazil, Venezuela, and Southwestern U. S.—is often not economically usable.

Three kinds of equipment have been developed by Rene Planiol, French scientist and mechanical engineer, to solve this problem: The first is a centrifugal crusher to reduce iron ore to a fine powder. Another is a magnetic separator to purify the iron oxide. The last is a high-temperature furnace in which the powdered and purified ore is reduced to liquid ferrous metal in a hydrogen atmosphere. All have been designed with an eye to low-cost operation.

Laboratory Phase Finished

Pluro, Inc., was organized in 1946 to perfect the process using these pieces of equipment. A $200,000 pilot plant in Brooklyn has been operated to test the value of the process.

Although the company is reluctant to give details about the equipment until patents have been issued, it doesn't hesitate to describe the general process.

Magnetite can be used directly (since it is, of course, magnetic) but hematite can be partially reduced to magnetite in the reducing furnace before magnetic separation. The ore powder is blown into the furnace by an inert gas, and the liquid iron (or steel, since carbon can be added to the ore before reduction) is drawn off at the bottom. Alloys can be made directly by mixing the iron ore with oxides of the alloying metals, or the metals themselves, as the case may be.

An interesting avenue of research is opened up by application of the crushing and separating equipment to beneficiation of lower-grade ores, either for this reduction process or for standard blast-furnace technique.

Larger Plans

The laboratory phase of the problem has been completed, and Benjamin R. Payn, one of the founders of the corporation, believes that the company is justified on the basis of present results to plan a larger pilot plant, which might be conveniently located in the Texas area where natural gas would provide cheap hydrogen and power.

Current plans envision a capacity of only a few tons per day. Although "bugs" have been eliminated in the laboratory, larger operation may introduce problems different not only in degree but in kind. The scale contemplated should reveal whatever problems will arise in full-scale operation.

The company is not shouting about its process until larger production proves or disproves its commercial utility. If it does prove technically and economically sound, it may open up large areas of ore deposits hitherto barred from profitable use.

BORERS FROM WITHOUT

Control of wood-boring insects in green timber and lumber offers large potential market for insecticides.

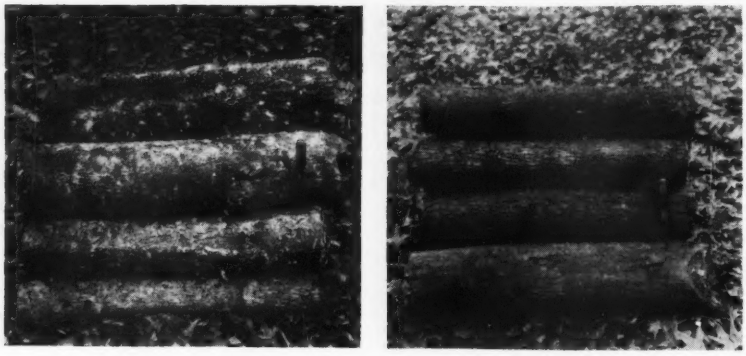
HAULING GREEN TIMBER from woodlands to the mill and converting it into lumber has always been more or less a race between timber operators and sawyers, ambrosia beetles and other wood-boring insects seeking to make a meal out of it. Now the lumberman is looking to insecticides—particularly benzene hexachloride—to slow down the pace and enable him to end up with more tree as good board.

Previously where immediate conversion to lumber has not been possible, operators have tried floating logs in fresh water, even submerging some types of wood, and storing logs in open fields. These methods of stalling insect attack are often impractical because the woodlands, particularly in the South, are distant from mills and accessible only a few dry months a year. Moreover, adequate supplies of timber must be kept at the mills to insure continuous operation through fall and winter. Solutions of dichlorodiphenyl oxide in kerosene have been used to control damage by ambrosia beetles, but protection was not permanent enough and the cost was too high.

Three Years' Tests

The Bureau of Entomology and Plant Quarantine at Gulfport, Miss., has tested different insecticides for such applications since 1944, and at the Third Annual National Meeting of the Forest Products Research Society, held in May at Grand Rapids, Mich., USDA entomologist R. Joseph Kowal outlined the problem above and reported on the last three years' tests. Emphasis was placed on control of ambrosia beetle which has caused particularly severe damage, although some attention was given to bark beetles and borers that attack pine timber.

Promising early results with DDT led to more extensive tests in 1946 with various formulations of that material and then preliminary tests with chlordane and benzene hexachloride (BHC), which



BORER INSECTICIDES: On the right, no dust nor holes.
USDA Dept. of Entomology and Plant Quarantine

proved very effective. Extensive tests at cutting sites and mills in Alabama, Louisiana and Mississippi with BHC and other of the newer synthetic organic insecticides followed during 1947 and 1948, and formulations and application methods for control of ambrosia beetle and less troublesome insects were developed.

For treatment of logs, a solution containing 17, 14, or 4.66 pounds of 10%-, 12%- or 36%-gamma BHC in 50 gallons of No. 2 fuel oil gave the best results. Two per cent of pentachlorophenol added to the solution was effective in preventing sap stain. Although emulsions were somewhat inferior to oil solutions, they are recommended where beetle attack is not too severe and protection of less than two months is sufficient. A water-soluble stain preventive such as Santobrite, Dowicide G, Permatox 10-S or Lignasan can also be used. Spraying with hydraulic sprayers as soon after cutting as possible is advised by the investigators, but fog spraying is promising despite erratic results.

Green Lumber

Although green lumber is not so susceptible to attack if handled properly and the moisture content is below 50%, long damp spells slow drying and invite insects. The treatment allowing the greatest safety margin and appearing to be most practical is a dip or thorough spray with a water emulsion of BHC, 50 gallons of which contain 2.33 pounds of 36%-gamma material. Common proprietary stain preventives can again be used. Fog applications of concentrated solutions also offer distinct possibilities if proper equipment is used.

Lumber in storage is commonly treated with a water suspension of wettable microfine sulfur to prevent attack by Lyctus powder-post beetles before it is thoroughly seasoned. Since this is compatible with combinations of DDT or BHC with sodium pentachlorophenate, these insects, ambrosia beetles, and sap stain can be controlled with one treatment.

Considerable losses are caused by damage to pine logs and pulpwood by such wood-boring insects as bark beetles and sawyers. Extension of work to this problem revealed that BHC was of much value here, too, and the preferred treatment appears to be 14 pounds (12%-gamma) in 50 gallons of No. 2 fuel oil. DDT, chlordane and toxaphene, however, all gave largely effective control. Remedial tests were unsatisfactory although BHC and DDT were as good in killing insect infestations as the standard orthodichlorobenzene. Pentachlorophenol appeared to reduce attack by stain and decay organisms, but stain here seemed to be related to the severity of the insect attack.

The cost of treatment will vary with the diameter of the log. Not including the cost of stain preventives, for oil solutions cost per M board feet by the International Log Scale ranges from 45 cents for logs 2.5 ft. in diameter to $1.30 for logs one ft. in diameter. Emulsions cost 25 and 75 cents respectively.

For lumber, costs run about $1.50 per M board ft. for spraying or dipping. Fog applications should be about the same. A cord of pulpwood may be sprayed for about 85 cents.

Quite a number of the large operators in the South are using the USDA information as well as those in South America. Since a few holes in such stock as flooring and furniture woods can reduce its value by 50 per cent, and tropical woods are often so severely attacked by insects that they are worthless, the lumber industry is anxious to put these new chemical methods of control to work. Response to Kowal's report, especially from the pine industries, has far exceeded expectations. He believes that there is a large potential market throughout the country for these insecticides to replace rapid handling methods now in use.

FUSED SALT PICKLE

Fused caustic plus oxidizing agents descales metals without loss of base metal.

A REVOLUTION in the descaling of metals is under way. Fused Virgo salt—principal ingredient: caustic soda—is rapidly replacing acid for descaling stainless and other alloy steels. Virgo salt descaling capacity has been doubled in the past year. The largest unit was completed only last December for Armco Steel Corporation at Middletown, Ohio. It holds well over 75 tons of fused salt and can handle very substantial hourly tonnages of sheets.

Application at present is limited to such high unit value products as stainless steel, but Hooker Electrochemical Co., which makes and sells Virgo salt, and the co-developer of the process, Tainton Products Co. of Baltimore, Md. (Tainton is now a division of Freeport Sulphur Co.), hopefully eye the much larger market that would be created by its application to all steels.

What Is It?

Virgo salt is a mixture of caustic soda, oxidizing agents, and certain catalysts. Alkali and alkaline earth chlorates, peroxides, nitrates, dichromates, manganates, and permanganates, and persulfates are noted in the basic Hooker patent as suit-

IONIC ETCHING

A UNIQUE method of examining metal structure has been developed by Ford Motor Co. engineers. It utilizes ionized atoms and is called cathodic vacuum etching. The metal is placed in a partial vacuum containing argon. A 12,000-volt charge sent through the vessel creates argon ions which bombard the metal surface, knocking off minute particles and bringing out the true microstructure of the metal with great detail and clarity. At the left Don McCutcheon, of Ford's applied physics research groups, runs a test.

able oxidizing agents. However, major emphasis in the claims seems to be on the use of alkali nitrates in concentrations of 5-10%. Normal operating temperature is 930° F., although temperatures as low as 850° F. and as high as 1250° F. can be used.

First

The first fused salt descaling process was the so-called electrolytic caustic process, introduced in 1936 by Tainton and Hooker. This was developed to supply the need for a process to make the surface of carbon steel wire sufficiently clean to permit electrogalvanizing.

In operation, the metal to be descaled was the cathode in a fused caustic soda electrolyte. Metallic sodium produced at the surface of the metal reduced the oxide scale leaving a readily removed spongy mass at the surface. This procedure suffered from one major defect—inability to obtain uniform current distribution with a resultant localization of electrolytic action and uneven cleaning.

Attempts were made to use this process for cleaning stainless steel, but the current distribution problem and relatively high electrical resistance of stainless steels made its application impractical. Thus stainless fabricators were forced to use costly acid descaling procedures, which sometimes have to be carried out as many as four times in a given fabrication because stainless cold works extremely rapidly. Each time that the metal was worked, it hardened and forced another annealing operation and another pickling. Base metal losses ran as high as two per cent per cleaning and stainless steel prices are in hundreds of dollars per ton.

Operation

In the new method, the bath can be used for years and requires only the addition of makeup salt equivalent to that remaining on the surface of the metal after it has been removed from the bath. The sludge that is deposited on the bottom of the bath must also be removed at intervals varying from about once a week to only once or twice per year.

The oxidizing agents in the Virgo salt are reduced during the usual descaling treatment. However, atmospheric oxygen circulating over the surface of the fused salt, abetted by the catalyst, reoxidizes these materials so that, in effect, the concentration of the oxidizing agent is never reduced.

Practical application requires that the fused salt bath be followed by a quench in water to remove a portion of the loosely adherent scale by violent evolution of steam from the metal surface as it cools. After the water quench, a thin uniform film remains which can serve as a base for drawing lubricants or as a finish. A final flash treatment with hydrochloric or sulfuric acids will easily remove this film. In the case of stainless, passivation of the HCl surface can be obtained by treatment with dilute nitric acid.

Less Stream Pollution

Caustic descaling not only cuts out metal losses but also greatly reduces the amount of waste discharged from the "pickling" plant, a great aid in the fight against excessive stream pollution. Consumption of Virgo salt by dragout varies with the size and shape of the article being treated, but it is usually about one per cent by weight of the metal being descaled. Thus treatment for stainless steels alone represents a potential market for many thousands of tons of caustic soda per year. This is welcome news to those worrying about the greater demand for chlorine than for caustic (*CI, June 1949, p. 936*).

ADD NO WEIGHTS

New balance gives weight directly by reading numbers on counter and three dials.

BACK IN 1945 James C. Jacobson saw an end coming to his war job with the Western Electric Company.

At this time Voland & Sons, Inc., longtime manufacturer of analytical balances at New Rochelle, N. Y., was for sale. For advice concerning the purchase of Voland, Jacobson turned to a fellow employee, Bernard Wasko, physicist coworker at Western Electric.

Their conversations ended in the purchase of Voland by Jacobson and his brother, Charles, and a job for Wasko too. He went to work to get rid of that old "quant lab" bug-a-boo, errors in reading, interpolation, and computation of the weights used in gravimetric analyses.

Veeder-Root Counter

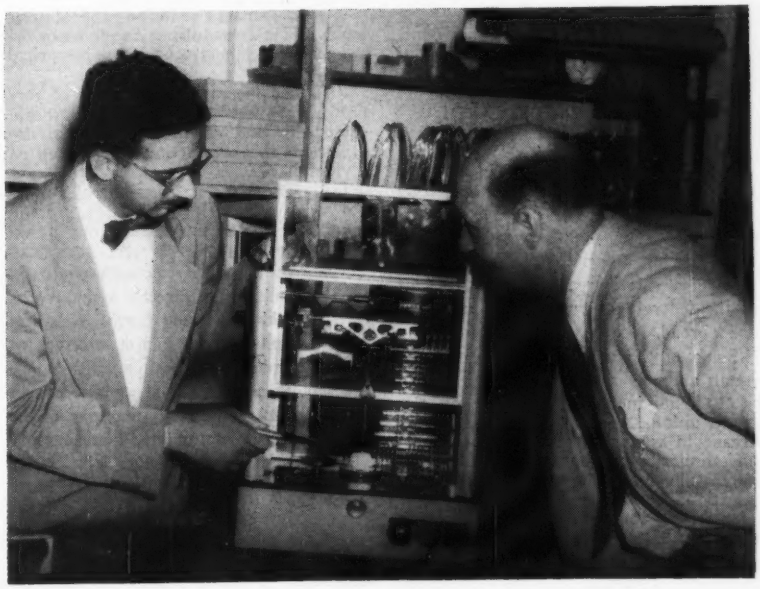
Even with the most modern chain-type balance it is necessary to read a vernier scale. With inexperienced personnel weighing times under two minutes verge on the impossible. Wasko attached a Veeder-Root counter to the chain. The counter gave a direct reading for that portion of the weight indicated by the chain.

But the case still had to be opened and closed to add the ofttime multitudinous weights to the balance pan. This continual movement of the atmosphere and difficult recording of the actual weight were subject to many errors.

Just Read the Numbers

Voland's new balance, the Speedigram, solves these problems by use of an ingenious system of cams and stainless steel and aluminum weights. The weights are controlled by movement of three dials located at the lower right corner of the balance case.

Addition of this system to the previously introduced counter has resulted in a balance that is completely direct reading, requires that the balance case be opened only once, has a sensitivity of 0.05 mg. at full load (200 grams) and with which inexperienced operators have achieved weighing times of less than two minutes. The price, $515, about twice that of a good chain-type balance, is expected to be competitive on a time-saving basis.



WASKO AND JACOBSON: Sensitivity was too complex.

RESEARCH ECONOMICS: Postwar vs. Prewar

The major economic problems facing industrial research today are not simply those of the typical recession. They are more deep-seated, longer term. Here, three questions for research management.

by ROLAND P. SOULE, Irving Trust Co., New York, N. Y.

THE BIGGEST economic problem now facing industrial research is not the downward swing of the business cycle, troublesome as it may be. Most research executives have experienced recessions in the past, and all of them are familiar with the temporary adjustments which must be made. The really difficult problems, whether they realize it or not, seem much more likely to be those which have been created by certain basic trends of a secular or long-term nature.

These trends have been clearly visible for many years but only recently have become business factors of major importance. They have injected new uncertainties in the planning of research programs. They are challenging previous concepts of the total amounts which can prudently be spent on research, the standards which a new project must meet to be acceptable, and the relative emphasis which should be placed on long-term vs. short-term research and on high-risk vs. low-risk products.

TRENDS AFFECTING RESEARCH

Industrial research operates today against an economic background strikingly different from that prior to the second World War. The war not only greatly accelerated many trends already in existence, but left a heritage of its own in the form of a vast increase in the operations of the federal government both at home and abroad.

Some of the more important of these trends are:

(1) The increasing power of the trade unions, resulting in a sharp increase in wage rates with little or no offsetting rise in labor productivity.

(2) The increasing rate of corporate taxation, beginning with 15 per cent (for the big companies) in 1937, rising to a peak of 85½ per cent of so-called "excess profits" in 1944, receding to 38 per cent of all profits in 1946, and now threatening to resume its upward trend.

(3) The increasing rate of personal taxation, particularly in the higher income brackets, and the continued inclusion of dividends and capital gains in taxable income.

(4) The further redistribution of wealth, with an increasing proportion going to the wage-earner and the farmer and a decreasing proportion to the salary-earner, the professional man, and the entrepreneur.

(5) The decline in the market value of corporate earnings, and the corresponding rise in the cost of equity financing.

(6) The sharp rise in the assets of insurance companies and of savings institutions, and the increasing proportion of private capital available to industry only in the form of debt obligations.

(7) The tightening control of the federal government over interest rates, and the further decline in the cost of debt financing.

(8) The sharp rise in the general price level and the resulting inadequacy of depreciation reserves based on historical costs.

(9) The increasing proportion of corporate earnings re-invested in plant and equipment and the corresponding decrease in the proportion distributed as dividends.

(10) The declining unit profit margin at any given level of sales and the rising level of sales necessary for "break-even" operations.

Many of these developments obviously are the result, either directly or indirectly, of the world-wide trend toward socialism and statism. We can expect a return to the economic conditions existing before the war, therefore, only if we also expect a reversal of the growing tendency of the American public not only to value security more than opportunity but to look chiefly to Washington to provide that security.

A CASE HISTORY

The impact of these trends upon the economics of research cannot be appreciated by reference only to the published statistics, prewar and postwar, for all industry. These statistics, in addition to being inadequate in many important respects, do not fairly picture what has been happening to the type of company which characteristically engages in research. Such a company is bigger than the average in size, spends a larger proportion of its income for research, and has experienced a faster rate of growth.

Accordingly, the ABC Manufacturing Company has been created to provide a case history which would be both complete enough and representative enough to permit some quantitative calculations to be made. The figures assigned to this company are, so far as possible, composites of the actual figures for similar companies selected from all branches of industry.

The various trends have been measured by comparing the changes which occurred between 1937, the top year of the prewar business cycle, and 1948, the peak year of postwar prosperity. The basic data on which ABC's performance in each year has been postulated are given in Table I (Economic), Table II (Industrial) and Table III (Financial). The history of the company's evolution in this eleven-year period is recorded in Tables IV, V, and VI.

Table IV, which summarizes ABC's income accounts in 1937 and 1948, represents the composite of 150 companies. ABC is shown to have had a 180 per cent increase in *dollar sales*, compounded of a 70 per cent expansion in unit sales and a 65 per cent rise in prices. In the same years the manufacturing production of the entire country (Table I) increased 76 per cent in units and 83 per cent in prices. During this period the big companies did not fare so well as the small ones. Thus, 555 large companies (Table II) were responsible for nearly 60 per cent of all manufacturing profits in 1937 but the same companies were able to account for only about 30 per cent of the total in 1947.

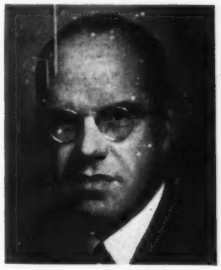
Based on a paper "Industrial Research at the Crossroads" presented by the author at the annual meeting of Industrial Research Institute, Inc., May, 1949.

The *net profit* of ABC in 1948 was 7.5 per cent of sales, the same as that of 1680 large manufacturing companies (Table II). Its margin was no wider than in 1937 although industry as a whole improved itself, due to its heavier weighting by the smaller and more volatile companies. In common with all industry, ABC's *dividends* declined as a percentage of net earnings. The proportion was 80 per cent in 1937 and 51 per cent in 1948—in each case close to the average of the larger companies (Table II).

Table V summarizes the changing *capitalization and asset position* of ABC. Both its buildings and its equipment were expanded, at steadily rising prices, to meet its 70 per cent increase in unit sales. As dollar sales grew, however, even more cash was needed for new working capital than for new plant. As a result, the company found it necessary to resort to outside financing. Table VI indicates that ABC financed its growth only a little more than half by retained earnings. This was less than the average for all industry since some companies needed less new money and others cut their dividends more sharply. The average company, as a matter of fact, provided out of its own earnings in this period something between two-thirds and three-quarters of its capital needs. And it obtained most of the balance by the sale of bonds. In the past ten years the proportion of bonds to equity in corporate financing has steadily risen until in 1948 almost 84 per cent of all new capital raised in this country was in the form of debt, with much of it privately taken by insurance companies. The other 16 per cent was about equally divided between preferred and common stock. Since the application of these percentages to ABC would result in an unrealistically small issue of preferred stock, the company is arbitrarily shown to have bonds and preferred stock outstanding in equal amount. In all other respects its balance sheet figures are the actual composites of the same 150 companies used for its income accounts.

The *earnings per common share* of ABC in 1948 were 2.7 times as great as in 1937, but its *market price* was less than 1.5 times as high. In this respect, however, ABC did better than the 365 industrial stocks averaged by Standard & Poor's (Table III). These stocks, with a smaller increase in earnings, rose only 11 per cent in price. All stocks, of course, suffered a sharp decline in their ratio of market price to earnings. The fall of ABC's ratio from 15 in 1937 to 8 in 1948 was no more than the average for many good grade companies. And, because price-earnings ratios declined, *stock yields* increased despite the widening lag of dividends behind prices. Thus ABC's common stock yielded 6.2 per cent in 1947, compared with 5.3 per cent in 1937.

These figures appear innocent enough at first glance. Upon closer examination, however, they will be seen in quite a different light. The questions which they raise may be found both unexpected and disturbing. Consider, for example, three in particular:



ROLAND P. SOULE is well known as an economist and chemical engineer. He received his doctor's degree in chemical engineering from Columbia University and has occupied the posts of chemical division manager of Combustion Utilities Corp., chief technologist of International Coal Carbonization Co., and technical economist for Tri-Continental Corp. Prior to his present connection with the Irving Trust Co. he was a vice president and director of American Machine and Foundry Co.

Question No. 1: Have research executives, while increasing the volume of their expenditures, also been making the necessary allowance for the more demanding financial standards of their projects?

IT IS easy to understand why industry as a whole (Table II) spent nearly five times as much on research in 1947 as in 1937. Total manufacturing profits before taxes rose in almost the same proportion, and during the war the 85½ per cent excess-profits tax acted as a powerful incentive for industry to make current expenditures for future benefits. ABC responded to these influences in much the same way as other companies. Its research expenditures kept pace with pretax earnings and by 1948 were four times those of 1937, although in terms of dollar sales they rose from 1.4 per cent to only 2 per cent. Whether ABC is now spending too much on research is a question to be reserved for later discussion. What can be asked at once, however, is what minimum rate of return must ABC earn on its successful projects in order to benefit its stockholders.

In answering this latter question it is necessary to recognize two different types of research. The first is purely necessitous in nature, and its aim is the insurance of existing profits. Its function is strictly defensive: to keep costs and quality at least the equal of the other fellow's and to maintain the company's competitive position in its industry. Work of this sort is vital to survival, and must continue as long as competition lasts. In principle, therefore, it is not an investment but an expense. It is as truly a part of the cost of doing business as raw materials or operating labor.

The second type of research is optional to the management, and its aim is to increase earnings. Its function is aggressive—to take a given amount of capital and to invest it in new products. The financial test of its success is not simply whether or not such an investment returns a profit to the company. It is whether the results thus obtained are enough to produce some net gain to the stockholders.

Most companies spend more money on the first than on this second type of research. Of course, no hard and fast line can be drawn between the two. A new product development designed to increase earnings may end up as only a defensive action which has kept profits from falling. In other words, the birth rate of new products may turn out to be no higher than the death rate of old ones as unexpected obsolescence takes its toll. Accounting-wise, therefore, no simple calculation can be made to determine how much of a company's research dollar is to be regarded as expense and how much as new investment.

The financial success of both types of research, however, is very sensitive to the rate paid for the capital necessary to translate laboratory results into commercial operation. As already noted, the kind of capital most widely used for this purpose has been retained earnings. The cost to a company of such capital is not represented, as in the case of preferred stock or bonds, by some pre-determined and unchanging rate. It is measured for any new project by the average rate of return that the company is able to earn over the life of that project on its already existing business. This average rate of return may of course be either above or below that prevailing when the project is started, but the higher it averages the more costly retained earnings become as a source of capital.

For financial purposes the already existing business of a company is best evaluated by the market price of its common stock. The sharp decline which has occurred in the ratio of the market price to earnings of almost all industrial stocks has correspondingly increased the cost of retained earnings. It has been pointed out, for example, that ABC's price-earnings ratio fell from 15 in 1937 to 8 in 1948. Expressed in reverse, the company's rate of earnings *after* taxes rose from 6⅔ per cent of its market price to 12½ per cent. Its rate of earnings *before* taxes, therefore, increased from about 8 per cent of

TABLE I—BASIC ECONOMIC DATA, MANUFACTURING COMPANIES

	1937	1947	1948	Ratio of 1948 to 1937	April 1949
Population (000)[1]	128,825	144,034	146,571	1.14	...
Production indices[2]					
Non-durable mfg. (46.87%)	106	172	177	1.67	161
Durable mfg. (37.93%)	122	220	225	1.84	213
Total mfg. (84.80%)	113	194	199	1.76	185
Minerals (15.20%)	112	149	155	1.38	147
Total production (100.00%)	113	187	192	1.70	179
Wholesale price indices[3]					
Manufactured products	87.2	146.0	159.4	1.83	152.9
Raw materials	84.8	165.6	178.4	2.10	165.8
All commodities	86.3	152.1	165.0	1.91	156.9
Gross natl. prod. (000,000)[4]	$90,200	$231,600	$254,900	2.83	...
Average hourly earnings, prod. workers in mfg. industries[5]	$0.62	$1.22	$1.34	2.16	$1.37
Index of output per man hour in manufacturing[6]	100[7]	106	107	1.07[7]	...

[1] Bureau of the Census.
[2] Federal Reserve Board (1935-1939 = 100).
[3] Bureau of Labor Statistics (1926 = 100).
[4] Department of Commerce (represents value of products and services of entire country; not limited to manufacturing companies).
[5] Bureau of Labor Statistics (average of 20 major manufacturing groups: 10 in durable and 10 in non-durable industries).
[6] National Industrial Conference Board (1939 = 100); based on data from Federal Reserve Board and Bureau of Labor Statistics.
[7] 1937 index is not available; 1939 index is 100.

TABLE II—BASIC INDUSTRIAL DATA, MANUFACTURING COMPANIES

	$000,000			Ratio of 1948 to 1937
	1937	1947	1948	
All mfg. companies[1]				
Sales	$61,459	$176,630	.....	...
Costs	57,748	158,430	.....	...
Pretax profits	3,711	18,200	.....	...
Income taxes	775	7,163	.....	...
Net profits	2,936	11,037	.....	...
Dividends	2,358	3,708	.....	...
Undistributed profits	578	7,329	.....	...
% Dividends of profits	80%	34%		
555 large mfg. companies[2]				
Net profits	1,720	3,380	4,300	2.5
Dividends	1,350	1,760	1,980	2.2
Undistributed profits	370	1,620	2,320	6.3
% Dividends of profits	79%	52%	46%	
1680 large mfg. companies[3]				
Sales	.....	92,500	107,500	...
Net profits	.....	6,570	8,060	...
% Profits of sales	.....	7.1%	7.5%	...
Net book value	.....	38,380	42,610	...
% Profits of book value	.....	17.2%	18.9%	...
Expenditures for research and development[4]	160	750	.....	...
Expenditures for new indl. plant and equipment[5]	2,500	7,500	8,300	3.3
New issues of industrial corporations[6]	616	1,974	1,944	3.2

[1] Department of Commerce.
[2] Federal Reserve Board.
[3] National City Bank.
[4] "A Program for Industrial Security," Report of President's Advisory Commission on Universal Training, Karl Compton, Chairman, May 29, 1947.
[5] Federal Reserve Board.
[6] Federal Reserve Board (issues for new money only; excludes retirement of securities).

TABLE III—BASIC FINANCIAL DATA

(Standard & Poors' Corporation)

	Annual Averages			Ratio of 1948 to 1937	April 1949
	1937	1947	1948		
Industrial stock prices[1]	118.1	128.0	131.5	1.11	124.2
Common stock yields[2]	4.83%	4.90%	5.53%	1.15	6.72%
Preferred stock yields[3]	4.45	3.79	4.15	0.93	4.07
Corporate bond yields[4]	3.45	2.63	2.70	0.78	2.57

[1] Index of weekly average of 365 industrial stocks.
[2] Aggregate cash dividends of above stocks divided by aggregate market value.
[3] Average of 15 high-grade non-callable issues.
[4] Average of high-grade (A1+) bonds. In April, 1949, yields of various grades of bonds compared as follows:
A1+2.57%; A1 2.65% A 2.76%; B1+3.11%.

its market price in 1937 to nearly 21 per cent in 1948. This means that when ABC's management undertook last year to finance by retained earnings a new project designed only to increase the company's profits, it was starting under the compulsion of having to earn a rate of return on the capital invested therein over 2½ times as high as was required in 1937. In either case if the rate of return on the company's already existing business should subsequently decline, the corresponding rate on the new project can decline to the same extent and the stockholders would be no worse off than if the project had not been undertaken. But the fact remains that whereas in 1937 the rate from which any such decline would start was only 8 per cent, in 1948 it was 21 per cent.

If it is not clear how the stockholders could have suffered even if the company earned something less than 21 per cent on the capital involved, consider their position if the management had paid out that capital in dividends instead of putting it in new plant and equipment. It is obvious that the stockholders could at least have purchased more ABC stock with their dividend money and had the benefit of whatever profits the company would have continued to earn without the benefit of the added project. Hence, if the new project did not yield at least as high a rate as ABC's already existing business could return, the stockholders would lose when thus deprived of their dividends by management.

If instead of using retained earnings ABC had financed its new project by additional common stock, it would also have had to earn this same rate of 21 per cent on the new capital thus raised. Assume, for example, that in lieu of paying $2,000,000 in dividends (Table IV), it had distributed to its stockholders an equivalent market value of its common stock, and had then invested the $2,000,000 in that project. Such an action would have required the issuance of approximately 61,500 shares (2,000,000/32.5). In order to prevent any dilution of its earnings of $4.05 per common share after taxes, or $6.75 before taxes, the company then would have had to earn the same amount on each new share. This would have amounted to $415,000 before taxes ($6.75 x 61,500), or 21 per cent of the $2,000,000. Unless the return exceeded 21 per cent, therefore, the stockholders would have made no financial gain on the transaction.

Or again, suppose ABC were to withhold $2,000,000 from dividends and simply invest it in its own stock—a not unprecedented operation*. It could purchase 2,-

* Texas Gulf Sulphur Company, for example, in October 1948 purchased 500,000 shares of its own stock for $27,500,000, or $55 a share (a price below the current market). Its 1948 earnings, which would have been $6.31 a share on 3,840,000 shares, were raised to $7.26 a share on 3,340,000 shares. The $0.95 increase in earnings would have required a 22 per cent pretax return on the $27,500,000 if invested in some alternative project.

000,000/32.5, or approximately 61,500 shares and its earnings would immediately rise from $4.05 a share on 1,000,000 shares to $4.32 a share on 938,500 shares. To obtain the same increase of 27 cents a share, or $270,000 after taxes, the company would have had to earn on some new project $450,000 before taxes, or 22½ per cent on $2,000,000. And this with no provision for any cost of research and no uncertainty about the outcome!

Of course, when a company invests its earnings in its own stock rather than in some new project, it is expressing a degree of confidence in the outlook for its own business that many managements do not feel. As a matter of fact, it is precisely because such confidence is so often lacking that so much is spent on research of the defensive type. And since such research is by definition necessitous, what else can be done, it may be argued, than to continue to finance it by retained earnings regardless of their rising cost?

Two procedures may be followed. The first is to subject even these so-called "necessitous" projects to a more rigorous screening. Suppose, for example, that it paid to save many products from obsolescence in 1937 when the needed capital cost only 8 per cent. It does not follow that it would also have paid to save the same products in 1948. Humanitarian considerations do not apply to dying products, and the research patient must show some evidence of its ability to win back its medical expense. And since its doctors, hospitals, and medicine now cost more than twice as much, it must be more than doubly worth the saving.

The second procedure is to consider, for the purpose of financing necessitous research, other kinds of capital than retained earnings. This would be, of course, *new* capital in the form of common stock, preferred stock or debt. Common stock capital, as already has been seen, is essentially the same as retained earnings, and has soared in cost. Preferred stock capital, on the other hand, has risen only moderately and debt has actually become cheaper.

The declining yields on high-grade preferred stocks and bonds are recorded in Table III. The corresponding figures for ABC's somewhat less high-grade securities are summarized in Table VI. It will be noted that the pretax cost to ABC of preferred stock capital increased from 5¾ per cent in 1937 to only 7 per cent in 1948, while the cost of funded debt declined from 3¾ to 3 per cent. In 1937 ABC could finance new projects by retained earnings or by new common stock at a cost little more than double the interest rate on long-term money. In 1948, however, the relative cost was just seven times as great!

How long this unprecedented spread will last is a matter of economic speculation. As earnings recede the price of

TABLE IV—ABC MANUFACTURING CO., INCOME ACCOUNT

Indices	*1937*		*1948*		*1949 Est.*	
Unit Sales	100		170		154	
Prices	100		165		162	
Dollar Sales	100		280		250	
	$000	*Index*	*$000*	*Index*	*$000*	*Index*
Sales	20,000	100.0	56,000	100.0	50,000	100.0
Cash costs	17,350	86.8	46,850	83.6	43,050	86.1
Depreciation	550	2.7	950	1.7	950	1.9
Gross profits	2,100	10.5	8,200	14.7	6,000	12.0
Research and development	275	1.4	1,100	2.0	1,050	2.1
Interest	0	0	100	0.2	100	0.2
Pretax profits	1,825	9.1	7,000	12.5	4,850	9.7
Income taxes	325	1.6	2,800	5.0	1,950	3.9
Net income	1,500	7.5	4,200	7.5	2,900	5.8
Pfd. div.	0	0	150	0.3	150	0.3
Net for common	1,500	7.5	4,050	7.2	2,750	5.5
Dividends	1,200	6.0	2,000	3.5	1,500	3.0
Undistributed profits	300	1.5	2,050	3.7	1,250	2.5
Additional deprec.	0	0	500	0.9	500	1.0
Available cash	300	1.5	1,550	2.8	750	1.5
Ratio of cash to research	1.1	....	1.4	....	0.7	.....
Per common share:						
Earnings	$1.50		$4.05		$2.75	
Dividends	1.20		2.00		1.50	
Market price, avg.	22½		32½		24	
Price-earnings ratio	15.0		8.0		8.7	
Yield, per cent	5.3		6.2		6.2	
Net income % of book value	11.2		17.3		11.9	
Common stk. earnings Before taxes						
% of book value	14.0		32.4		22.0	
% of mkt. price	8.3		20.8		19.1	
After taxes						
% of book value	11.2		19.4		13.2	
% of mkt. price	6.7		12.5		11.5	

TABLE V—ABC MANUFACTURING CO., CAPITALIZATION

	December 31st 1937	1948
3% 20 year debentures	$0	$3,500,000
4¼% preferred stock	$0	3,500,000
Common stock (stated value $7.50 per share)	1,000,000 shs.	1,000,000 shs.

Balance Sheets

1937	*$000*		*$000*
Cash and governments	1,800	Notes payable	0
Receivables	1,800	Other payables and accruals	1,200
Inventories	4,400	Reserve for taxes	400
Total current assets	8,000	Total current liabilities	1,600
Fixed assets 12,000		Debentures	0
Depreciation 6,000		Preferred stock	0
Net fixed assets	6,000	Common stock	7,500
Other assets	1,000	Surplus	5,900
Total assets	15,000	Total liabilities	15,000
Net working capital	6,400	Cash ratio	1.1
Book value, common stock	13,400	Current ratio	5.0
Market value	22,500		

1948	*$000*		*$000*
Cash and governments	5,000	Notes payable	1,000
Receivables	5,000	Other payables and accruals	3,400
Inventories	12,600	Reserve for taxes	2,800
Total current assets	22,600	Total current liabilities	7,200
Fixed assets 20,500		Debentures	3,500
Depreciation 9,600		Preferred stock	3,500
Net fixed assets	10,900	Common stock	7,500
Other assets	1,500	Surplus	13,300
Total assets	35,000	Total liabilities	35,000
Net working capital	15,400	Cash ratio	0.7
Book value, preferred stock	24,300	Current ratio	3.1
Book value, common stock	20,800		
Market value	32,500		

TABLE VI—ABC MANUFACTURING CO., SOURCE AND DISPOSITION OF FUNDS

	000 Omitted			
	1937	*1948*	*Gain*	*Percentage Distribution*
Retained earnings (surplus)	$5,900	$13,300	$7,400	52%
Preferred stock	0	3,500	3,500	24
Funded debt	0	3,500*	3,500*	24
Total source of funds			14,400	100%
Net working capital	6,400	15,400	9,000	63
Net fixed assets	6,000	10,900	4,900	34
Other assets	1,000	1,500	500	3
Total disposition of funds			14,400	100%

* Exclusive of $1,000,000 of bank loans included in current liabilities.

Cost of Capital

	1937		*1948*	
	Before Taxes	*After Taxes*	*Before Taxes*	*After Taxes*
Common stock or retained earnings	8%	6¾%	21%	12½%
Preferred stock	5¾	4¾	7	4¼
Funded debt	3¾	3¾	3	3

stocks may not recede so much, particularly if dividends are generous. If this happens, price-earnings ratios will rise and retained earnings will cost less. One school of thought even holds that when earnings have completed their cyclical decline, price-earnings ratios will have returned to their 1937 level.

Now this theory may be true but it is well to consider what other factors are involved. The price-earnings ratio of a company's stock at any given time is a measure of the confidence of the investor in the durability of the earnings and dividends of that company at that time. Investors have far more confidence today in the durability of bond interest than of stock dividends, and the spread between the yields of bonds and stocks is now close to its all-time high. This spread will narrow, price-earnings ratios will rise, and the cost of equity financing will decline only when investor confidence is restored. And investor confidence requires more than faith that a stable and satisfactory level of business has been established. It also requires faith that income taxes will not be further raised, that labor rates will not further outrun labor productivity, and that industry will not be further hampered by regulations of an unduly restrictive nature.

In the meantime, all prospective projects to be financed by retained earnings or by new common stock must be judged by much more rigorous standards than were required before the war. In order to be acceptable as reasonable risks, they must show the promise of a far higher rate of return upon whatever capital is indicated to be required for their eventual commercialization.

Question No. 2: Have research executives given full recognition to the significance, particularly at the present high level of research expenditures, of new factors affecting not only the cost but also the supply of available capital?

THE MOST conspicuous economic change recently observed by research executives is probably that of management's tightening grasp on the purse strings. Retained earnings have not merely become more costly; they also have shown distinct signs of becoming less plentiful.

One warning sign is the present inadequacy of depreciation reserves and the necessity of supplementing them from taxable earnings. This new competition for surplus funds has existed for some years but was obscured by the rapidly rising profits of the postwar period. As earnings return toward a more nearly normal level, however, management is going to become keenly aware, if it has not already done so, of a new drain on its cash that did not exist before the war.

A basic principle of accounting is to charge against annual profits such amounts as will, by the time a company's various items of plant and equipment are worn out, create a reserve equal to their original cost. This principle makes no allowance for any subsequent decline or rise in the country's general price level, whereby the actual money required to replace the worn-out items may at the time of replacement be less or more than that provided in the reserve accounts. Thus, in the deflation of the middle nineteen-thirties depreciation reserves were more than adequate and actually supplied surplus cash for other purposes. Now, with prices nearly double those of 1937, the reverse is true. Depreciation reserves are woefully insufficient, and the financial reports of most companies overstate their true earnings. Some managements have increased their reserves but the increases are not tax-allowable. So—to add insult to injury—it is now necessary to earn $1.67 before taxes in order to get the extra dollar after taxes which must be added to the dollar in the depreciation reserve to provide the two dollars required to replace today something which cost only one dollar when it was originally bought.

ABC in 1937 had fixed assets of $12,000,000 on which it was charging depreciation of $550,000 or about 4.6 per cent. In 1948, its management found it necessary to ear-mark approximately $500,000 of net earnings for additional depreciation to offset the increased replacement cost of these assets. Even when this sum was deducted from undistributed profits, however, the cash remaining for various capital expenditures was in that boom year 1.4 times its research expense, compared with only 1.1 times in 1937 when research expenditures were much lower (Table IV). And, it must be added, it was not only a much higher level of earnings that contributed to this easy cash position, but also a less generous policy with respect to dividends.

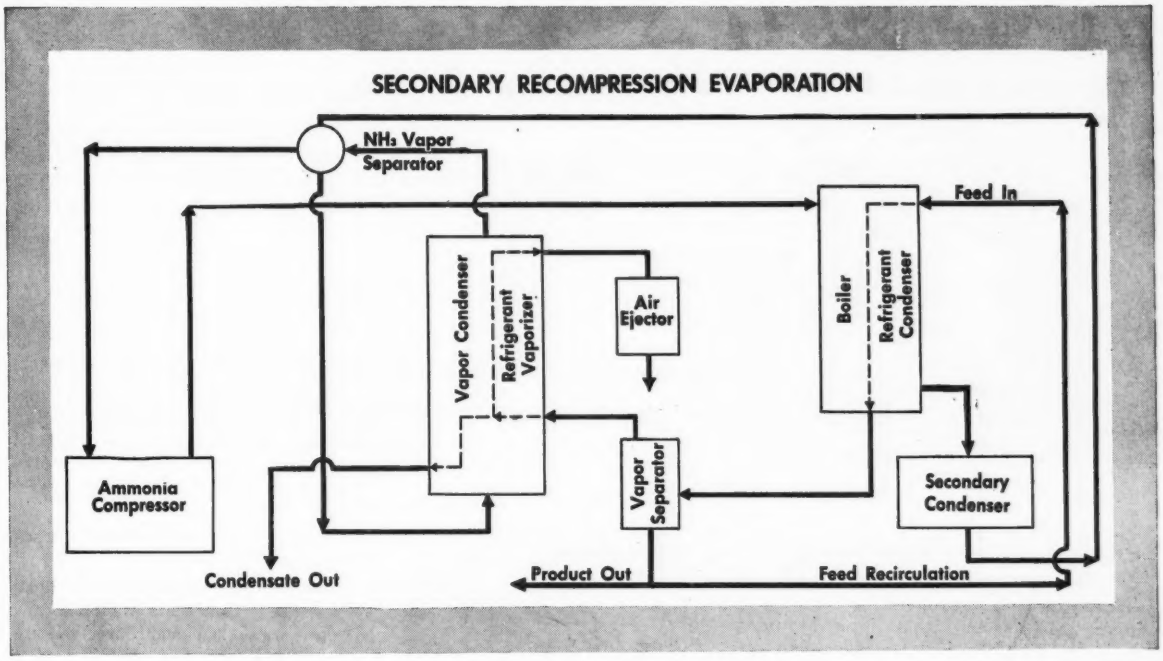
Table IV shows that in 1949 it is anticipated that ABC's cash position will suffer not only from inadequate depreciation but also from shrunken earnings. It is estimated that, compared with 1948, its unit sales will be down by 9 per cent, its prices by 2 per cent, its dollar sales by 11 per cent, and its net income by 31 per cent. No such performance is necessarily forecast for industry as a whole in 1949, and these figures are to be regarded as purely illustrative in nature. But if it is felt that this hypothetical decline of ABC is timed too soon or goes too far, it would be well to note what happened in 1948 to 335 manufacturing companies* which reported sales decreased below 1947:

Bracket of Sales Decline	*Number of Companies*	*Average Changes: '48 vs. '47 Sales*	*Net Income*
1–10%	166	− 5%	−24%
11–20	89	−15	−46
21–30	53	−25	−75
Over 30	27	−42	Deficit
Total	335	−14	−47

Nearly half of this group of companies experienced an average reduction of 24 per cent in net income on a 5 per cent decline in sales, and the entire group suffered an average reduction of 47 per cent in profits on only a 14 per cent decline in sales. This ratio of reduction in profits to decline in sales was much greater than in the pre-war period and is an important new factor to consider. It has resulted from a shrinkage in the unit profit margin (at any given level of sales) and has produced a sharp rise in the "break-even"

* As reported in the April, 1949, Letter of the National City Bank. These companies are part of the 1680 companies cited in Table II.

(Turn to page 286)



BTU Economy By Secondary Recompression

SINGLE-EFFECT EVAPORATION SYSTEM using a refrigerant fluid to circulate heat is more economical than a double-effect evaporator.

SECONDARY recompression evaporation is the latest solution to the age-old problem of desiccating heat-sensitive materials without thermal decomposition.

This process, a development of Mojonnier Bros., of Chicago, Ill., was first installed in the plant of Florida Citrus Canners Cooperative, Lake Wales, Fla., to make Birdseye frozen orange juice concentrate. Similar installations were later made at five other plants.

Two multi-stage units also recover ethanol and insulin from the solution formed by extraction of pancreas glands. A solution of insulin in 65% ethanol enters the evaporator. Insulin solution is first separated and 85% alcohol is produced. Ninety-eight per cent of the alcohol charged is recovered with the temperature never exceeding 60° F.

Evaporation at atmospheric pressure often requires temperatures so high that product decomposition occurs. Steam distillation and evaporation under high vacuum are two ways of avoiding such decomposition.

In any thermal process BTU economy is of the greatest importance. Heretofore this has been achieved in evaporation by use of multiple-effect or recompression apparatus (*CI, Aug. 1947, p. 213*). In recompression evaporation, the effluent vapor from the evaporator is compressed to recover heat and thereby reduce fuel requirements: The vapor temperature rises sufficiently for heat to flow into the fluid coming into the evaporator and boil it. Thus, the boiler is also the condenser for a recompression evaporator and vice versa. Huge volumes of vapor per BTU are generated in high vacuum evaporation systems, however, and compression requires expensive equipment.

Reducing the volume of vapor that must be recompressed is Mojonnier's answer to this problem. A fluid with a lower boiling point (and consequently lower specific volume) than the material being evaporated is introduced into the system. This fluid, in heat-exchange relationship with the system, absorbs heat from the vapor at the condenser and gives it up to the feed at the boiler. The recirculated heat is moved from the condenser to the evaporator boiler by recompressing this second fluid—thus the process name, *secondary recompression evaporation.* This greatly reduces the volume of vapor which must be compressed, reducing the capital cost of a recompression evaporation plant to a practical level. For example, the new orange juice plant would require recompression of 1208 cubic feet of water vapor to recover 1058 BTU; the same amount of heat is recovered by recompressing only 7.2 cubic feet of ammonia vapor.

The Mojonnier system can be engineered for any evaporation temperature from 40° F. to 160° F. Also, water for cooling can usually be eliminated.

In concentrating orange juice, raw feed enters the evaporator boiler where desiccation takes place at 60° F. (The boiler in turn serves as the condenser for the refrigerant, ammonia, which condenses at a temperature of 100° F.) The vapor from the feed passes to a vapor separator where the liquid concentrate is collected for freezing and packing, a portion being recirculated. Vapor from the vapor separator is then carried to the vapor condenser, also operating at 60° F. The refrigerant, boiling on the other side of the heat exchanger tubes at 45° F., absorbs heat from the condensing water vapor. The refrigerant vapor from the condenser is then mechanically compressed before its return to the boiler. Compression raises the temperature of the vapor to 100° F.

Although recompression of the ammonia vapor permits reuse of approximately 146 BTU per cubic foot of vapor compressed, this figure does not represent a total saving—power is required to run the compressor. Economywise, the Lake Wales setup will provide evaporation at a lower cost than a double-effect evaporator system.

Flexibility Keynotes Carbide's New Research Center

EDITORIAL STAFF REPORT

MODERN CONSTRUCTION FEATURES in Carbide and Carbon Chemicals Corp.'s new multimillion-dollar research center near South Charleston, W. Va., enable quick adaptation of layout and equipment to new projects.

IT IS IN the very nature of research that its course cannot be predicted with any degree of assurance. A "hot" project today may be "cold" tomorrow, but some impertinent observation may lead down an unfamiliar but promising by-path.

Such considerations persuaded Carbide and Carbon Chemicals Corp., when it was planning its new research center near South Charleston, W. Va., to build as much flexibility into its facilities as is possible. While its new research building contains nothing of startling novelty, it does embody many of the best design ideas that have evolved over the past few years.

Situated on a 140-acre tract near the company's plant, the center will consist of a central research building (which has been completed), four development buildings, a high-pressure laboratory, and various service buildings. Construction was started over two years ago, and the completed project will eventually house fundamental organic and resin research as well as process development work. The entire research staff formerly quartered within the company's main plant on Blaine Island will move to the new center, thus releasing room there for expansion of the works laboratory and the plant process development department. While the company's research will be centralized at the new location, it will continue to be supplemented by projects at Mellon Institute, Pittsburgh, and Boyce-Thompson Institute, Yonkers, N.Y.

MODULE PLAN

Planning for the new research facilities was begun before the war; and these plans crystallized in 1945 when preliminary designs were prepared. Subsequent studies of needs, combined with the benefit of experience from other modern research laboratories, showed where many improvements could be made over the original plans.

The laboratory building, a three-story T-shaped structure 325′ x 96′ is designed on a module of 13′ x 24′. Permanent gypsum block partitions are spaced at 39′ intervals, and movable metal partitions are used to provide rooms of 13′ and 26′ width. The 24′ depth was designed to accommodate multiples of standard 3′ laboratory furniture sections. The standard 13′ x 24′ room accommodates two or three workers. All laboratories range along one wall of the building, simplifying the installation of service piping and exhaust ducts.

All in all, the building contains 69 laboratories, 48 offices, a large-scale laboratory, a library, and an auditorium seating 125, in addition to necessary storage and service rooms. Containing a volume of 1,250,000 cubic feet, the building provides 76,000 sq. ft. of floor space, exclusive of the basement (26,000 sq. ft.)

An interesting feature of the structure is the use of only one row of columns, which runs through the middle. Contributing to easier changes in the arrangement of partitions, this design feature has given rise to substantial economies in a period of skyrocketing building costs.

SERVICE FLEXIBILITY

As flexible as the size of the rooms and the disposition of the furniture are the services available to the individual laboratories. There are actually fourteen separate utilities available to each laboratory bench:

Hot water	Nitrogen
Cold water	Oxygen
Distilled water	Hydrogen
Cold brine	Steam at 15 lbs.
Fuel gas	Steam at 200 lbs.
Compressed air	110 volt AC.
Vacuum	220 volt AC.

Outlets are at the rear of the laboratory benches, permitting easy shifting of bench arrangements.

All service supply lines extend through vertical shafts from main headers in the basement at each bay, and connections are made at each floor to permit horizontal run-outs. From the horizontal lines, branches to the service strips at the rear and above the laboratory benches, to hoods, to distillation areas, and to sinks run either along the partition walls or in covered, easily accessible floor recesses. In addition, doors to the vertical shafts in the corridors permit shutting off utilities in individual laboratories in case of emergency.

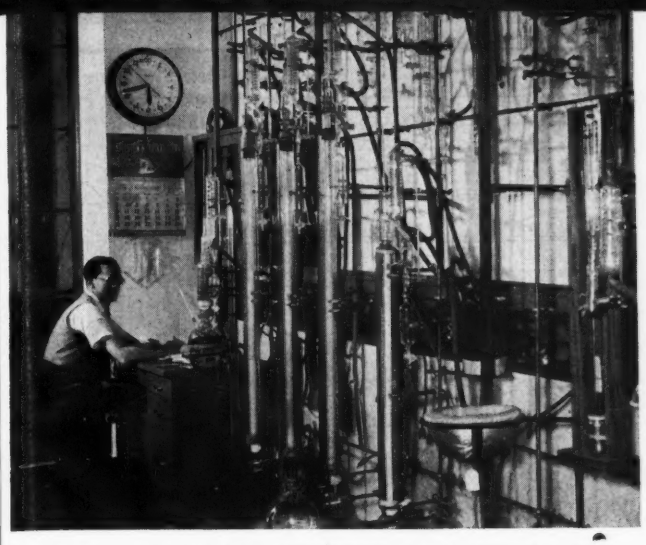
A special structural system provides a completely flexible arrangement for supporting piping, shelving, and laboratory equipment in the individual rooms. Called "Unistrut," it consists of steel channel members, clips and other fittings which can be assembled with a wrench and a hacksaw. It is virtually a working-size version of the "Erector" set, allowing quick and easy dismantling and rearrangement with complete re-use of the constituent parts.

AIR-CONDITIONED

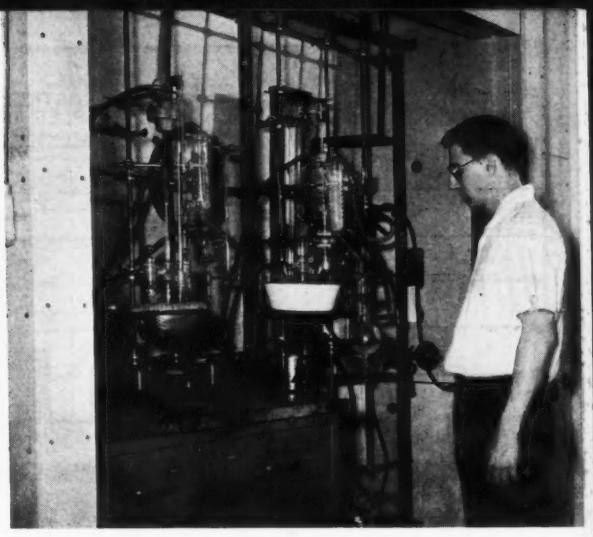
All the laboratories and offices are air-conditioned (80°F., 50% relative humidity maximum in summer; 70°F., 25% relative humidity minimum in winter). A 600-ton refrigeration unit maintains these conditions, and incoming air is cleaned by electrostatic precipitation.

Elaborate precautions have been taken to prevent contamination of office areas and cross-contamination between laboratories. This is accomplished by providing each laboratory with an exhaust fan that creates a negative pressure with reference to the corridors and offices.

Fume hoods, with which most of the laboratories are equipped, require much more air than can be economically supplied from the conditioning system. Each



Still area showing typical laboratory set-up. Panel along the wall contains outlets for the various services supplied to the laboratory.



Fume hoods have an independent supply of clean, tempered air. Note versatile "Unistrut" scaffolding for mounting equipment.

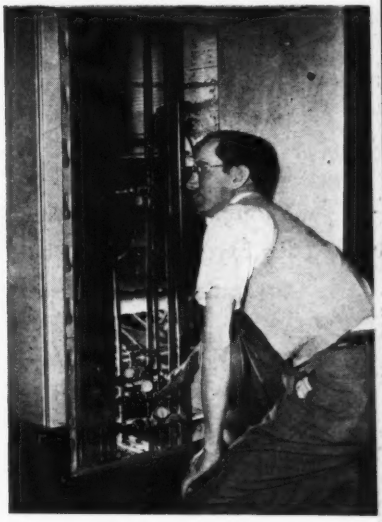
hood, therefore, is supplied independently with clean, tempered air. When a hood is placed in operation, the air supply duct is opened and the exhaust fan speed is doubled. Both of these operations are actuated by a single lever.

Vertical duct systems for air-conditioning and the fume hood exhausts are all located in the center of the building adjacent to the columns. Ductwork is thus held to a minimum and hidden from view.

Other features contribute to employee safety and comfort: fluorescent lighting, which provides an average of 40 foot-candles at all working levels; vibration absorption; and such standard safety features as outward-swinging doors with panic hardware, fire detection and extinguishing equipment, gas masks, safety showers and blankets, and at least two avenues of escape from each laboratory room.

The opportunity to use Carbide-developed materials has not been overlooked: The front paneling of the laboratory building and lobby showcases are of stainless steel; but the interior paneling of the lobby and all office window sills are of "Bakelite" phenolic resin-bonded plywood. Floor tile is all Vinylite, and Vinylite upholstery is used on furniture in the lobby, conference room, auditorium and rest rooms. The electric wire insulation too, is of vinyl materials or polyethylene.

Hundred-yard corridor on main floor. Laboratory doors swing outward for easy egress.

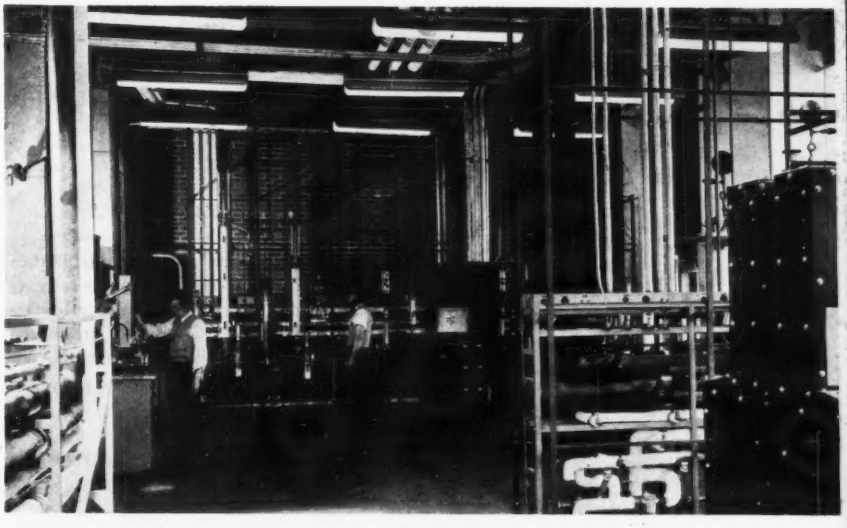


Another safety feature is master service control for each laboratory, located in corridor.

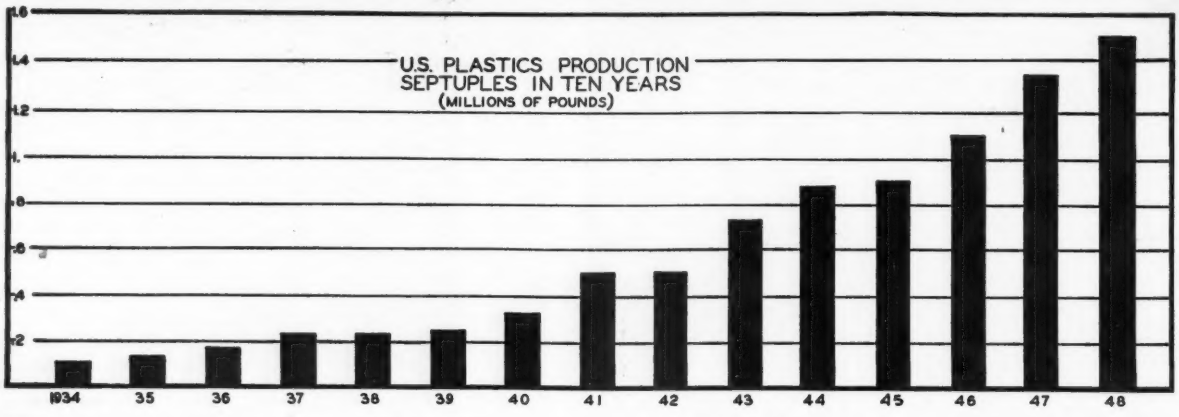
OTHER BUILDINGS

In the high-pressure laboratory equipment is housed in individual cells facing a high earth bank. An 18″ reinforced concrete barrier separates the cells from the central corridor, and the cells are partitioned off by a double wall of ¾″ steel plates separated by 3″ of sand fill.

Other structures now in operation are a 40,000 lb./hr. steam plant, a maintenance and equipment fabricating shop, and a cooling tower.



Large-scale laboratory provides step between laboratory bench and pilot plant.



Raw Material Requirements of the PLASTICS INDUSTRY

by GILBERT THIESSEN
Koppers Co.; Pittsburgh, Pa.

RAW MATERIAL SUPPLIES FOR THE PLASTICS INDUSTRY are now in balance. Adequate supplies exist for the expansion of all types other than the benzenoid plastics. Low-temperature coal carbonization or coal hydrogenation will furnish needed benzenoid raw materials.

THE plastics molding and fabricating industry is unique in that its raw materials are, in themselves, highly manufactured products. Any increase in supply of such materials depends upon the growth of specialized chemical manufacturing industries which stand between them and the ultimate raw materials.

The necessary raw materials for the present plastics industry were made available by the two World Wars. Large volumes of inexpensive synthetic phenol and a background of newly acquired experience in its production were provided by World War I. In the 'twenties the new and growing radio industry offered an outlet for phenol as phenolic resins.

World War II caused the erection of huge facilities for large-scale production of styrene to be used for the production of synthetic rubber. The end of the War and the replacement of much of the synthetic rubber with natural rubber supplied large quantities of styrene monomer at low cost. Also, much new knowledge about polymerization techniques was acquired during the War under the intensive research of that period. Tonnage production of polystyrene was the result.

WHAT IS THE PLASTICS INDUSTRY?

The plastics industry produces synthetic resins and molds them. Fabrication of synthetic resins into fibers (textiles) and coatings (paints, varnishes, and lacquers) is not usually included in any consideration of the plastics industry. However, these uses compete for the same ultimate raw materials and add to the manufacturing volume with resultant lower unit manufacturing costs. Thus, any discussion of raw materials for the plastics industry must consider the raw materials requirements of the synthetic organic coatings and fibers industries.

The most important plastics and synthetic resins are:

Cellulosics	Vinyls
Phenol-Aldehydes	Polyethylene
Urea-Aldehydes	Polystyrene
Acrylics	Nylon
Alkyds	

CELLULOSIC PLASTICS

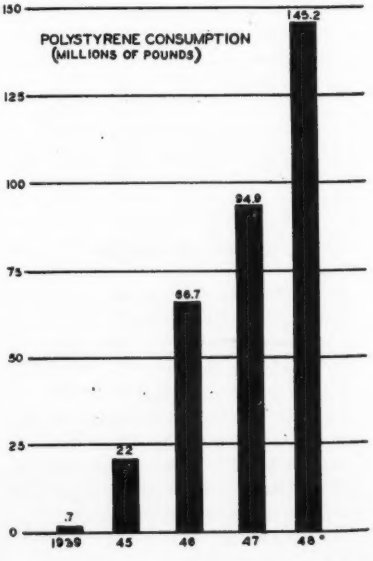
Historically the nitrocellulose plastics are the oldest. They are rapidly decreasing in importance. Two major manufacturers of them have recently announced discontinuance of their manufacture.

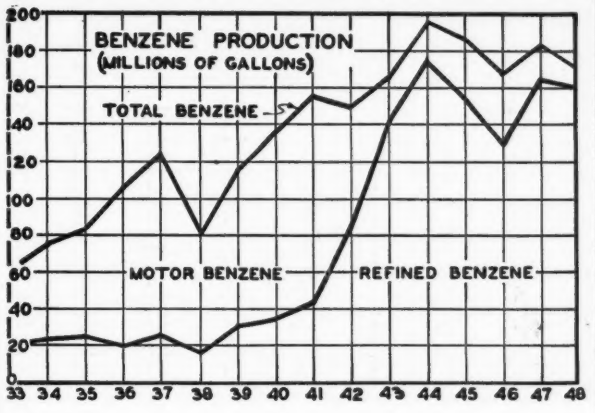
The raw material requirements for the nitrocellulose plastics are cellulose, nitric and sulfuric acids and camphor for plasticization. These raw materials are widely available, and since this plastic is declining in importance, raw material requirements offer no problems.

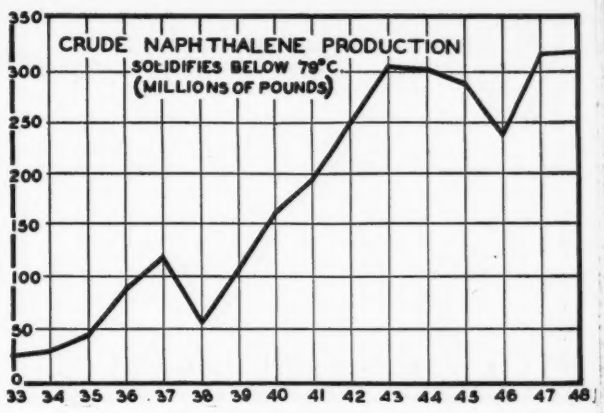
Cellulose acetate flake or equivalent
- Cellulose
- Acetic anhydride or equivalent
- Caustic soda
- Acetone

Plasticizer
- Phosphorus oxychloride
- Cresols
- Phthalic anhydride
- Octyl alcohols
- Nonyl alcohols
- Butyl alcohols
- Ethyl alcohols
- Hydrogen chloride

Cellulosics have recently declined in importance. Cheap polystyrene with its better resistance to moisture was the principal reason.







PHENOLICS

At present, the most important plastics are the phenolics. Phenolic molding powders, laminating and coating resins, adhesives and casting resins sold in 1948 amounted to 376 million lbs., or about 25% of the 1.48 billion lb. synthetic resin total. The raw materials required for phenolic resins are:

Phenol or equivalent
- Benzene
- Sulfuric acid
- Chlorine
- Caustic soda

Formaldehyde
- Methanol
- Methane, ethane, propane, or butane
- Air or oxygen

Fillers and re-inforcers

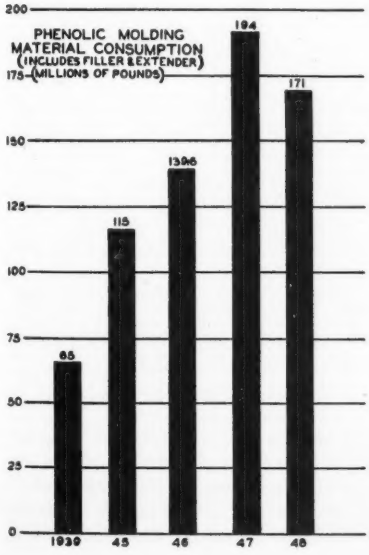
Prior to World War I, all U. S. phenol production was from natural sources. Wartime demands for picric acid required the erection and operation of synthetic phenol plants, and the end of the War found the country with a "war surplus" of over 40 million lbs., equal to six years normal requirements. However, the rapid growth of the phenolic resin industry used up this surplus in three years and forced erection of new synthetic phenol plants.

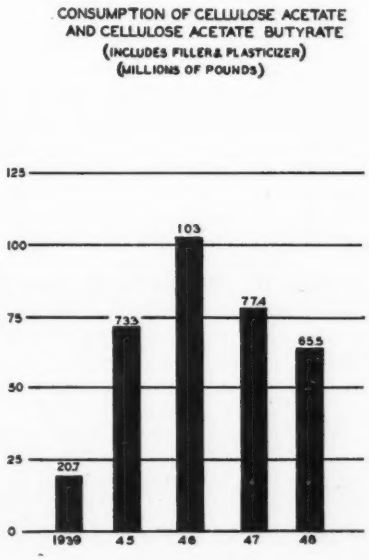
Today the still expanding synthetic phenol production is more than ten times the production of natural phenol, which is at its practical maximum. Competition and research have made phenol available in ever-growing quantities at a price which allows little room for further decline. Even with the succession of synthetic processes—sulfonation, chlorination, and Raschig—there still remains the elusive goal of slipping inexpensive oxygen from air between a hydrogen and carbon in the benzene ring by direct oxidation, although a plant using such a process did operate for some time. During the last war, the supply of phenol was insufficient to meet demands and was, therefore, rationed. Shortness of supply was due to lack of sufficient plant capacity rather than lack of raw materials. Since the war, a number of new plants have been built and put into operation and phenol is again available in quantities to meet all present requirements.

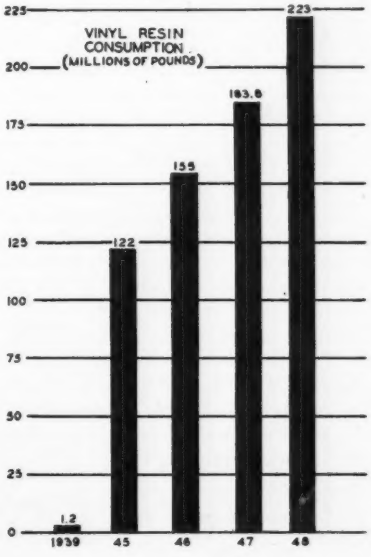
Benzene is the essential raw material by any process now used. Production of the 274 million pounds of synthetic phenol in 1948 required 32 million gallons of benzene, or about 20% of the total available. More will be said about benzene supply and demand in the discussion of polystyrene.

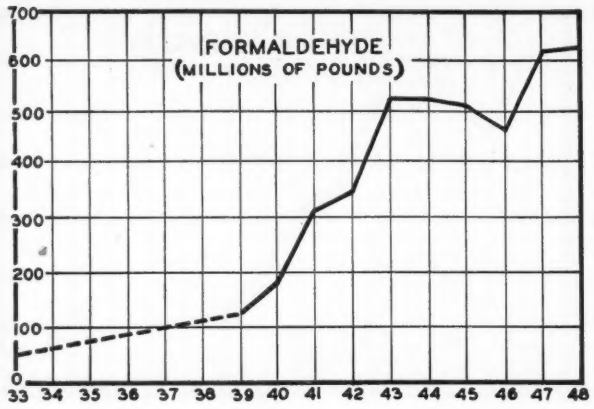
The quantity of cresols available at present prices is limited by the amount available in coke-oven tar plus those recovered from petroleum cracking products (*CI, Jan., 1947, p. 48*).

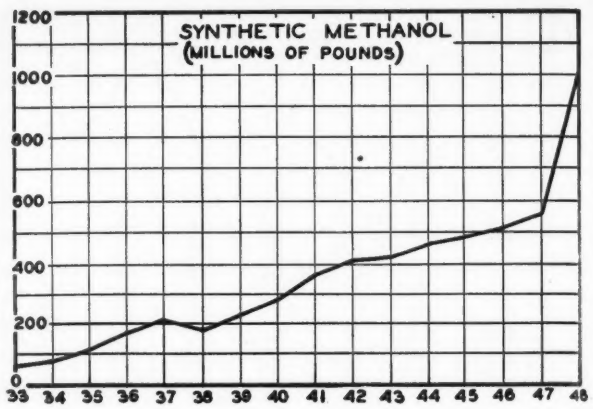
At present it is not possible to synthesize cresols at prices competitive with the cost of the natural cresols or with phenol. Synthetic para-cresol is listed at 50¢ per lb.; synthetic phenol at 12.5¢ per lb. Higher prices for cresol supplies can usually be afforded by manufacturers of plasticizers, chemical products and disinfectants. These greatly reduce the already small supply of cresols and xylenols for the plastics industry. As cresol alternatives for modified resins the industry uses alkylated phenols such as para-tert-butylphenol, para-tert-amyl-phenol, para-phenyl phenol and similar products made from synthetic phenol. Recently the isopropyl phenols have been made available











at prices slightly above those for the cresols. These more nearly approach the cresols than do the other alkyl phenols mentioned above.

Will there be other sources of cresols in the future? There are three possibilities: (1) synthesis from toluene; (2) "low-temperature" coal-carbonization and (3) coal liquefaction by hydrogenation. The first still seems remote in view of the large amount of effort spent on the problem in the past. Occasionally rumor has it that the problem of low-cost cresol synthesis has been solved but, so far, none has come on the market.

The second possibility, that of "low-temperature" carbonization, is looking up again. With increased pressure for smoke control in our larger cities in which high volatile bituminous coals are important domestic fuels, "low-temperature" carbonization of coal may increase in extent. One major unit is just now coming into full production.

The third possibility, while remote in time, is very definite. Hirst, Skinner and Donath* have recently estimated that a 30,000 barrel per day hydrogenation plant using 12,500 tons of coal per day would produce 1,330 barrels or 467,000 pounds per day of phenol, cresols, and xylenols. This is about 2% of the coal charged. Estimates as high as 5% and even 8% for some high oxygen coals have previously been made. Contrast this with the less than 0.2% of tar acids recovered during high temperature carbonization. Further, let it be remembered that the 200 barrel per day hydrogenation plant recently completed by the United States Bureau of Mines as a demonstration plant, i.e., a big pilot-plant, if operating steadily, could produce about 1 million pounds of tar acids per year.

The average daily run to stills of petroleum in the United States is about 5 million barrels. If coal hydrogenation is becoming even a small factor in our liquid fuel supply, the quantities of tar acids available will be of an entirely different magnitude than we have today. Both industry and Government are spending large sums in a study of this problem.

Formaldehyde is the other major chemical raw material for phenolic resins. It, together with methanol, can be made either by direct partial oxidation of the C_1, C_2, C_3, and C_4 hydrocarbons with air or oxygen, or it can be synthesized from a mixture of carbon monoxide and hydrogen. This mixture can be prepared from water gas or from natural gas. **Methanol** is readily converted to formaldehyde by direct air oxidation. Why, then, were methanol and formaldehyde in short supply? The units in which synthetic methanol are made must be large in order to be economical. Investment is large and a continuing market must be in sight. Construction of new plants was restricted during the war because of the large amounts of specially fabricated steel pressure vessels they required. Synthetic ammonia plants were built instead. Equipment in synthetic ammonia plants can quite readily be converted to methanol production and such conversions were planned for the post-war period. However, the increased need of the world for fertilizer nitrogen shifted these plans. With rising demands for formaldehyde due to increased availability of phenol after the war, the situation was further aggravated by accidental damage to some operating units. War and post-war troubles now have been eliminated and formaldehyde is again in ample supply.

UREA AND MELAMINE RESINS

These products also require urea or melamine, and formaldehyde about which we have just spoken. The raw materials are:

Urea
- Ammonia
- Carbon dioxide

Formaldehyde
- Methanol
- C_1-C_4 Hydrocarbons
- Air or oxygen

Urea is made from ammonia and carbon dioxide and only plant capacity should limit supply. Although urea is of increasing interest as a fertilizer and cattle food adjunct, a large proportion of production is available for plastics (*CI, April, 1949, p. 559*).

Melamine is made from calcium cyanamide, which in turn is made from calcium carbide and nitrogen. Calcium cyanamide is made principally for fertilizer markets and should, therefore, be in ample supply for plastics production. The limitation here, if any, is plant capacity for the conversion of calcium cyanamide to melamine.

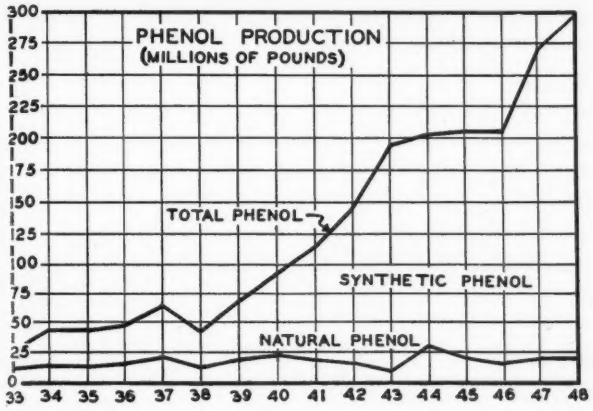
POLYSTYRENE

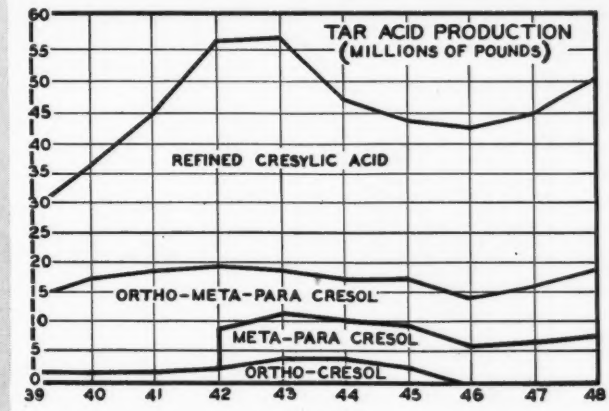
Only styrene monomer is required for polystyrene production. The monomer is made from benzene and ethylene, and of these benzene is required in the largest weight ratio. The 377 million lbs. of styrene monomer produced in the United States in 1948 required approximately 40 million gallons of benzene. Styrene monomer and phenol account for the major portion of the 170 million gallons of benzene now used in the United States.

Most benzene comes from the high temperature by-product oven carbonization of bituminous coal. About 1.8 gallons are available per ton of coal coked. Because the chemical industry is growing faster than the by-product coke industry, which is tied to the steel industry, demand in the chemical industry has nearly caught up with supply. Thus there has been a continuing shift of benzene from motor fuel and solvent markets into the chemical industry and a tendency toward price increases.

Production of GR-S synthetic rubber during the War placed an unprecedented drain on benzene supplies. About 25% of GR-S is styrene and at the peak of production about one million tons per year were made. Nineteen forty-eight production was some 400,000 long tons and 1949 production may be 350,000 tons. With fluctuations of this magnitude reflected in styrene and further in benzene demands, the effects are of an entirely

* Hirst, L. L., Skinner, L. C., and Donath, E. E., "Improvements in Hydrogenation of Coal," U. S. Bureau of Mines, Information Circular 7486, Dec. 1948, pages 5 and 6.





different magnitude than are the fluctuations in benzene requirements for purely chemical uses. Barring any upward change in GR-S production, as some have predicted would follow the introduction of "cold" rubber, the benzene supply situation is now easy.

Alternative benzene sources are petroleum and coal hydrogenation. At present prices, production of benzene from petroleum will be moderate but an unprecedented demand might make it profitable to recover large amounts of benzene from petroleum.

Just what this price differential must be has not yet been definitely established but it appears to be greater than ten cents per gallon over present prices.

Coal hydrogenation as a source of benzene is now, of course, only a prospect. But if a national synthetic liquid fuel program is undertaken and coal hydrogenation is selected as one of the processes, large quantities of benzene could be made available.

Ethylene can be made by dehydrating ethyl alcohol, ethyl ether or by hydrocarbon cracking. Because it is a gas which is difficult to liquefy, transportation for great distances is rarely practical. Ethylene is usually made on the spot, or plants using it are near large petroleum cracking plants where great quantities are available as a by-product of gasoline manufacture. Ethylene and its close relatives — propylene and acetylene — have grown in importance to the extent that they now far outshadow the coal-carbonization raw materials in volume and value of products made from them. In versatility and number of products, the "coal-tar" products still hold supremacy.

As long as petroleum products are freely available, there need be no concern about raw materials for ethylene.

POLYETHYLENE

This plastic requires only ethylene—very pure ethylene—for its manufacture. From a raw materials supply standpoint, therefore, there should be no practical limit to the availability of polyethylene.

VINYL RESINS

For the vinyl resins, ethylene and acetylene are key raw materials. Their availability is limited only by the capacity of facilities for producing them. Raw materials used are:

Resins
- Acetylene
- Ethylene
- Hydrogen cyanide
- Hydrogen chloride
- Chlorine
- Acetic acid
- Ethylene oxide
- Acetone

Plasticizers
- Phosphorus pentoxide
- Cresol
- Phthalic anhydride
- Sebacic acid
- Ethanol
- Butanols
- Octyl alcohols
- Nonyl alcohols

The vinyl resins are like the cellulosics. Plasticizers are an essential ingredient. Vinyls are not very useful by themselves. They must be compounded with viscous high boiling liquids having the correct properties to yield tough useful products. Because of the large volume of the vinyl resins and their requirements for plasticizers, a sufficient supply of suitable plasticizers is and will continue to be a growing problem of the vinyl resin industry. These plasticizers are mainly esters, the most important of which are the cresol and related esters of phosphoric acid and the alkyl esters of phthalic acid, for example, tri-cresyl phosphate, dibutyl phthalate, diethyl phthalate and di-octyl phthalate. The phosphates give flame-resistant compounds and the phthalates give low-temperature properties and have a low initial cost. The critical materials in each case are cresol and phthalic anhydride. Phthalic anhydride is made largely from naphthalene. The only alternative source is the moderately available petroleum ortho-xylene. Thus both the phosphates and phthalates are dependent upon the coal-carbonization industry.

The future availability of cresols was discussed under Phenolics. Phthalic anhydride is also in demand by makers of alkyd resins, largely for protective coatings and by the chemical industry for dyes and other products. Imported naphthalene (37.5 million lbs. in 1948) and use of o-xylene has provided a plentiful supply for the moment (*CI, April, 1949, p. 573*). For some ester plasticizers the availability of the alcohol has, in the past, been the limiting factor. Such limitations now seem to have been eliminated.

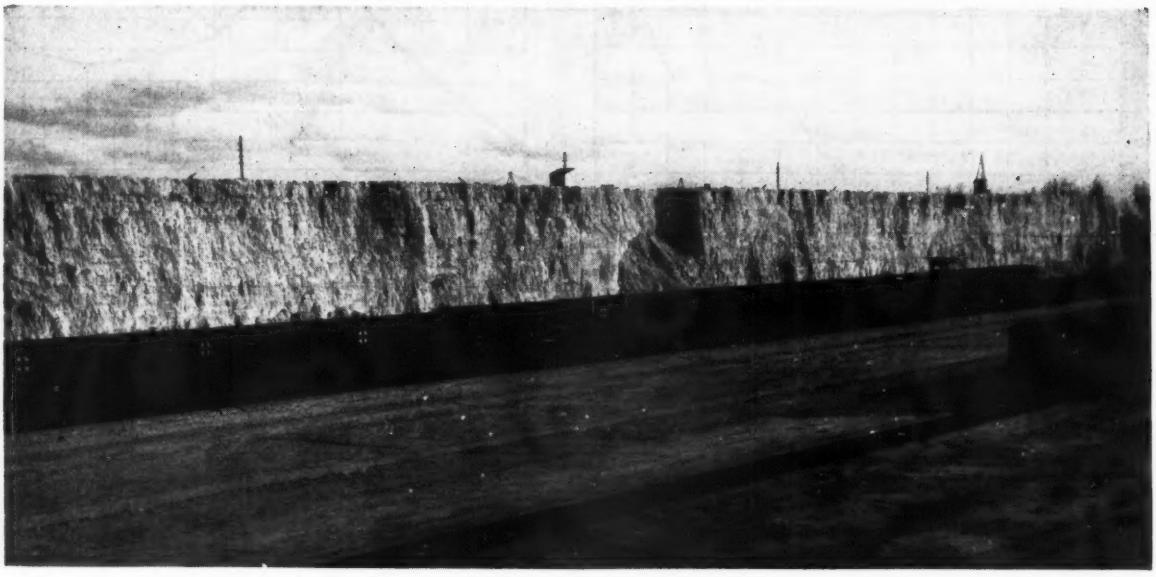
ALKYDS

At present the alkyd resins find only a minor use as plastics. But there is some promise of an increase in this use (*CI, Oct., 1946, p. 589*). They and their modifications, on the other hand, find extensive use in the protective coatings field. The raw materials are:

- Phthalic anhydride
  - Naphthalene
  - O-Xylene
- Maleic anhydride
  - Crotonaldehyde
  - Benzene
  - Naphthalene
- Glycerol
  - Propylene
  - Fats and oils
- Penterythritol
  - Formaldehyde
  - Acetaldehyde
- Drying oils
- Styrene
  - Benzene
  - Ethylene

Their interest here is because of their competition for certain raw materials which are also of importance to the plastics industry, namely phthalic anhydride, phenolic compounds and, recently, styrene monomer. The alkyd resins have exceptionally good qualities for protective coatings, and it is stated by some that their use is limited only by their availability. Their large phthalic anhydride requirements has been a big factor in the growth of phthalic anhydride production and the consequent price reduction due to volume production. Phthalic anhydride, in turn, is the largest use for naphthalene.

For the long term outlook, there should be a continuing full demand for phthalic anhydride. However, the availability of naphthalene and o-xylene will put a ceiling on these demands until either low-temperature carbonization or coal hydrogenation enter our economy.



What's Ahead for the Sulfur Industry

by WILLIAM W. HAY
Lord, Abbett & Co., Inc., New York, N. Y.

RAPIDLY MOUNTING DEMANDS FOR SULFUR and sulfur compounds is forcing greater dependence upon pyrites and by-product sources.

RESERVES of crude sulfur are being depleted twice as fast as before the war. The Bureau of Mines and the Geological Survey[1] conservatively estimated the life of known "commercial" reserves of sulfur as of 1944, measured in terms of 1935-44 annual rates of consumption, at 39 years. In the interim, there have been four years of extremely heavy production. A continuation of the present rate of removal would place reserves at less than 25 years—a reduction of 14 years in only four years. However, reserves are quite often extended during the life of the property.

ELEMENTAL SULFUR

Practically all elemental sulfur produced in the United States is mined from salt domes located on the Gulf Coast of Texas and Louisiana. The very thorough geologic logging of most of this area in the never-ending search for oil militates against the possibility of major new discoveries.

Of a total of 106 salt domes discovered, ". . . 47 had showings of appreciable amounts (of sulfur)."[2] Production has been attempted from 17 domes; only seven are in operation at the present time. One of the seven is practically exhausted, while the life of two of the operations is known to be limited to a few years. Two or perhaps three other domes are known to have sulfur in "commercial" quantities, and these are included in the Bureau of Mines estimate mentioned above. However, it is not yet known whether they can be mined economically —another imponderable in the question of "commercial" reserves.

An unknown factor is the probable discoveries of sulfur domes in the current huge offshore drilling program of the oil industry. The value of such discoveries is problematical because of the need of proper well spacing to obtain low production cost.

MINES PRODUCING CRUDE SULFUR

Operator	*Remarks*
Texas Gulf Sulphur Co.	
Boling, Texas (1929)	Largest operation
Moss Bluff, Texas (1948)	Being developed
Freeport Sulfur Co.	
Hoskins, Texas (1923)	
Grande Ecaille, La. (1933)	
Jefferson Lake Sulphur Co.	
*Clemens, Texas (1937)	Exhausted this year
*Long Point, Texas (1930-'38)	Re-opened, 1946
Duval-Texas Sulfur Co.	
Orchard, Texas (1929)	

* *Owned by Texas Gulf Sulfur Co.*

These limited reserves and the accelerated depletion rate are a cause of increasing concern, since salt domes are the only source from which large tonnages of sulfur can be produced easily and quickly. The higher cost of producing large amounts of sulfuric acid or elemental sulfur from other sources could mean a readjustment and price increase as more and more pyrites are utilized.

And where are today's huge tonnages of sulfur going? Probably the most important influence on the post-war demand for the material is the insatiable cry for fertilizers of all forms, and this can be expected to intensify. Of course, the principal direct use for sulfur is for making sulfuric acid, which consumes about 55% of total production. About two-thirds of the 10 million-odd tons of the acid produced in this country each year is used by fertilizer makers, chemical manufacturers and petroleum refiners. The two latter consuming channels are also growing rapidly and will continue to require more and more sulfur. When export demand is super-imposed, it becomes apparent that other sources will have to be found and developed.

PYRITES

Before the development of salt domes in the United States, the principal source of sulfur was pyritic ores, and this is still the most important source for the rest

of the world. Pyrite roasting to obtain sulfur dioxide for the preparation of sulfuric acid began more than a century ago and very effectively curbed the monopoly then held by Sicilian brimstone. A new demand for economy in operation of the then-used Le Blanc soda ash process led to the development of the Klaus process for the recovery of elemental sulfur from hydrogen sulfide gas which, as a by-product of the Le Blanc process, was polluting the countryside. The Klaus process is now being applied to the recovery of sulfur from sour petroleum gases and coke oven gas.[3]

An appreciable tonnage of sulfur equivalent is produced in this country from miscellaneous sources. Almost 10 per cent of our sulfuric acid is made directly from sulfur dioxide recovered from roasting sulfide ores in lead and zinc smelters. In this country, where crude sulfur, chemically pure, is cheap, no brimstone is produced from pyrites, and such acid as is produced is limited by freight charges to nearby markets. But, as our reserve of the elemental material approaches depletion, we are faced with producing elemental sulfur from pyritic ores located at a distance from markets. This will be economical when some new process is developed or when the market price of sulfur advances sufficiently to cover the higher cost.

There are numerous other elemental sulfur sources, but the operations are small and the aggregate recovery does not match the production of one of the smaller domes. Nevertheless, an increasing amount will be recovered from petroleum sources and from fuel gas in coming years. Several installations are in operation to recover brimstone from sour natural gas; more are on the way, and the first to recover sulfur from the refining of sour crudes has just been placed in operation.

RECOVERY OF SULFUR

As Elemental Sulfur

Owner/Operator	*Process*	*Charge*	*Daily Capacity gross tons sulfur per day*	*Location*
Texas Gulf Sulphur Co. Pure Oil Co.	Girbotol-Own	natural gas	270	Wyoming
Stanolind Oil & Gas Co. and others	Girbotol-Stone & Webster	natural gas	70	Wyoming
Hancock Chemical Co. The Texas Co.	Girbotol-Simon-Carves	refinery gas	50 (a)	California
Freeport Sulphur Co. The Texas Co.	Girbotol-Own	refinery gas	40	New Jersey
Noranda Mines, Ltd.	Own	pyrites	100 (b)	Quebec
Southern Acid & Sulphur Co.	Girbotol-Own	natural gas	70	Arkansas
As Sulfur Dioxide				
International Nickel Co. and Canadian Industries, Ltd.	Own	nickel-copper sulfides	70 (c)	Ontario

(a) *Duplicate plant proposed.*
(b) *Pilot plant.*
(c) *Initial output.*

CANADIAN DEVELOPMENTS

Two recent Canadian developments[4] aim at production of sulfur from sulfide ores, but only one is now being placed in large-scale operation. This is the process developed by the International Nickel Co. of Canada, Ltd., in conjunction with Canadian Industries, Ltd. International Nickel is changing its metallurgical process, and by the time the entire operation is altered, there may be available for Canadian paper mills a great deal more than the initial output of 40 thousand tons of liquid sulfur dioxide per year.

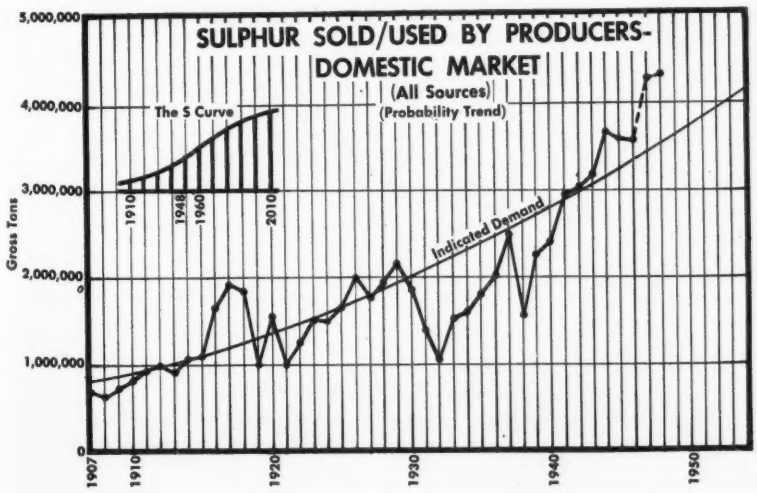
The process under development by Noranda Mines, Ltd., for the formation of elemental sulfur and a blast furnace charging stock by controlled roasting of pyrites is the second possible source for Canada. Although a very large pilot unit has been in operation for some time, no plans have been announced for the construction of a commercial unit.

These developments are of importance to us because Canada imports about 300 thousand tons of crude sulfur annually from this country. Every ton of sulfur equivalent produced in Canada over and beyond the normal growth of its requirements would be an increase in our diminishing reserves.

SULFUR (ALL SOURCES) SOLD/USED BY PRODUCERS

Year	*Mine Production*	*Exports*	*Net Domestic Shipments* (1)	*Pyrites* (2)	*By-Product and Recovery* (3)	*Net Domestic Supply* (4)
			(M gross long tons)			
1940	2,732	746	1,820	362	182	2,364
1941	3,139	729	2,344	333	206	2,983
1942	3,461	568	2,472	438	214	3,024
1943	2,539	654	2,525	431	232	3,183
1944	3,218	654	2,905	486	303	3,691
1945	3,760	919	2,907	378	290	3,575
1946	3,860	1,180	2,848	425	290	3,558
1947	4,441	1,356	3,490	449	298	4,237
1948	4,869	1,295	3,590 est.	423	...	4,234

(1) *Mine Shipments less Exports ± Stock.*
(2) *Sulfur Content (see text).*
(4) *Sum of (1), (2) and (3).*
(5) *Data from Department of Commerce and Bureau of Mines*



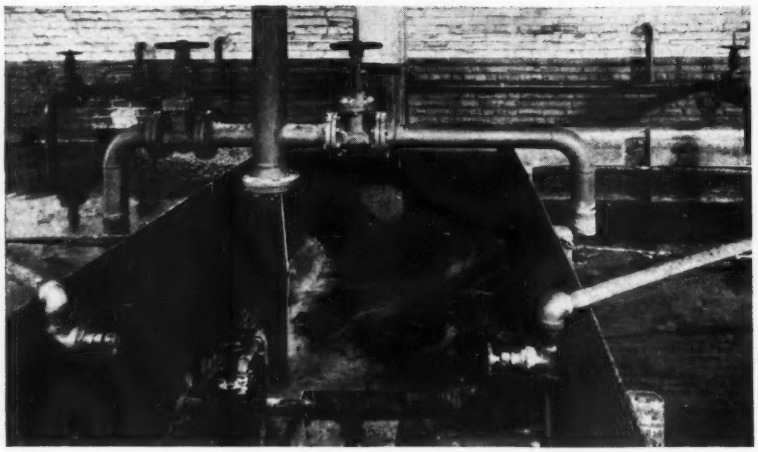
ORKLA PROCESS

Texas Gulf Sulphur Co. owns the Western hemisphere and Australasian rights to the Orkla process for recovering sulfur from pyritic ores. This process combines the two processes used in the ordinary smelting of pyrites. The blast furnace is fitted with a closed top so that the free sulfur cannot burn, as there is no oxygen present; excess coke (carbon) is added in the charge and the sulfur dioxide produced by high temperatures is reduced by the coke present. A gas is thus produced which contains only nitrogen, carbon dioxide and sulfur vapor. On cooling this gas, the sulfur vapor condenses and elemental sulfur is recovered.

The original Orkla plant is in Norway. There is a small plant in Portugal using the process, and Rio Tinto Mines, Ltd., in Spain, has converted three furnaces to this process.

From what is known of these European operations, it seems likely that large-scale production of sulfur by this process must await discovery of suitable ore bodies or attainment of a suitable price combination for the end products. It does not now pay to treat pyritic ores to obtain sulfur at distances remote from the markets and any early use of the process in this country is not foreseen at present price levels.

(*Turn to page 294*)



Close-up view of piping to and from the detention tanks.

CHEMICAL WASTE Disposal At a TEXTILE PLANT

SEGREGATION OF WASTES BY TYPE and pre-disposal treatment of the small proportion requiring it is more economical than mass treatment of the unsegregated whole.

UTILIZATION of existing municipal sewerage and sewage treatment systems is obviously more economical than constructing private facilities. This approach, then, should be given first consideration whenever circumstances permit.

Municipal policy usually permits such industry usage, provided the sewerage can accommodate the added load, and the wastes do not damage the sewers or treatment plant or interfere with sewage treatment processes.

An example of this approach is the new waste-disposal procedure now operating at Chester Lace Mills, in Chester, Pennsylvania. The management came face-to-face with the problem when it could no longer dispose of liquid wastes in nearby Morton's Run, which empties into the Delaware River. To continue the practice would have entailed a substantial capital expenditure for treatment of the liquid wastes to make them acceptable under Pennsylvania sanitary regulations.

The solution developed by chemical engineers of Hall Laboratories, Pittsburgh, began with this approach to the problem: Determine the total water consumption, nature of its use, and the character and volume of resultant liquid wastes; then apply the old political maxim, "divide and rule" to the variety of wastes to be disposed of.

The liquid wastes proved to be classifiable as "very dilute," "dilute," and "strong." The first two could be disposed of without treatment; why mix them with the strong wastes, which would unnecessarily build up the total volume of liquid wastes requiring special attention?

The strong wastes could be made acceptable for admittance to municipal sewers by (1) partially neutralizing them, and (2) regulating the volume of their discharge so as to avoid overloading the city sewerage system.

OPERATION

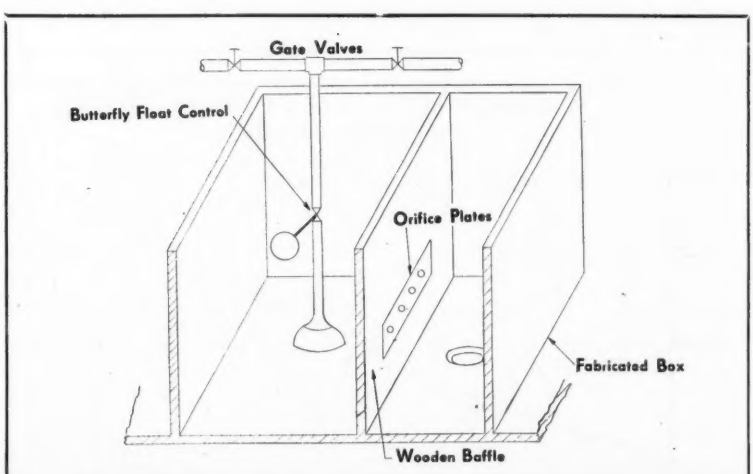
Two detention tanks, located beneath the bleachyard floor, receive the strong liquid wastes by gravity flow from the kiers and associated equipment. This arrangement made elaborate piping and pumping unnecessary. Waste liquids from such operations as "wet-out," rinsing, kiering, bleaching, "acid-sour," washing, starching and dyeing are composited in the detention tanks, which have a combined capacity almost double the estimated maximum strong-waste volume produced in an operating day.

Two tanks are operated on a fill-and-draw basis. All the strong wastes are dumped initially into one detention tank. At the end of the day, the operator tests the waste to determine approximate pH.

When he has determined the amount of acid needed to adjust the pH of the liquid waste to pH 8, and added the required volume of 50 per cent acid for the purpose, the operator switches on a small industrial pump, running it for one hour to assure thorough mixture of wastes and neutralizer.

The neutral liquors may then be pumped at a controlled rate, along with the dilute and very dilute wastes, to the municipal sewer system.

Total initial cost, and operating cost, of the new disposal system for the liquid wastes were reported by mill officials to be far lower than the alternative: treatment of the liquid wastes equivalent to the primary treatment of municipal sewage.



Detail of the steel orifice box. Plugging one or more of the four ¾" orifices permits step-wise regulation of discharge rates. A 1¼" butterfly float-operated valve above the centerline of the orifices maintains a 2" constant head.

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Victor Carbamide Phosphoric Acid consists of white rhombic colorless and odorless crystals. Mol. Wt. 158. One pound of carbamide phosphoric acid has the same acidity as one pound of 62% phosphoric acid. Carbamide phosphoric acid is an efficient catalyst for acid setting resins, and is used in acid type cleaners. It is recommended where a solid crystalline material equivalent to phosphoric acid is desired.

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V4	Formic acid . . . manufacturing drugs for the relief of allergies.	☐
V5	Sodium tripolyphosphate and tetrasodium pyrophosphate . . . builders in soap and detergents.	☐
V6	Phosphoric acid . . . rustproofing metals and as a bond for paint.	☐
V7	Victawet ® 12,35B and 58B . . . dye carriers and dispersing agents.	☐
V8	Calcium and iron phosphates . . . mineral supplements, capsules and tablets.	☐
V9	Phosphoric acid . . . electropolishing stainless steel and other metals.	☐
V10	Carbamide phosphoric acid . . . acid setting resin coatings for paper.	☐

Name_____ Title_____

Company_____

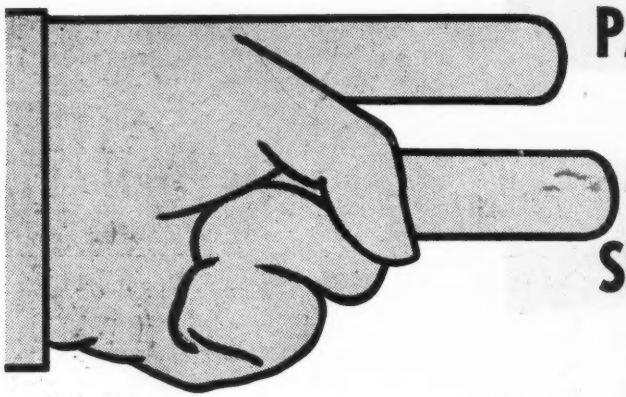
Address_____

City_____ Zone____ State_____

V2

double duty

1. LESS DUSTING WHEN PACKING



2. LESS SIFTING WHEN PACKED

SHUR-CLOSE Valve Bags have already gained wide acceptance throughout industry. Operating men in packing rooms claim the SHUR-CLOSE Valve helps eliminate objectionable dust. Many consumers in the fertilizer and chemical fields are requesting that their shipments be packed in SHUR-CLOSE multi-wall bags. They know that this new valve locking feature prevents waste of valuable material in transit. Make your own filling and sealing tests with SHUR-CLOSE bags. Packing tests by some of the leading fertilizer companies prove the superiority of the SHUR-CLOSE Valve in preventing sifting and escape of material.

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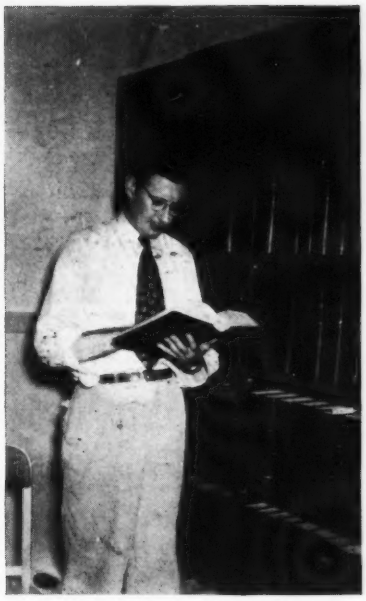
NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE

LAUREN B. HITCHCOCK, named research director, National Products Corp., and president of National Dairy Research Labs.

THEODORE H. RIDER, appointed director of research for Lever Brothers Co. He previously was associate director of research.

HOMER R. DUFFEY, appointed general manager of the chemicals department, The Quaker Oats Co., replacing Dr. Hitchcock (above).



WILLIAM J. PEPPEL, named director of the Jefferson Chemical Co.'s new Austin labs.

EDWARD F. DEGERING, who has been appointed assistant chairman of chemistry and engineering research at Armour Research Foundation.

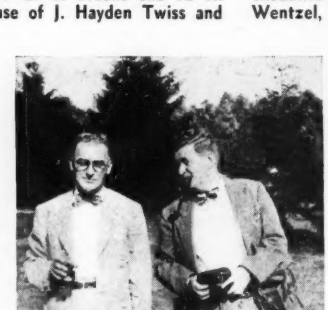
R. E. HULSE, formerly associated with Du Pont's Niagara Falls plant is now director of research, National Distiller's Products Corp.

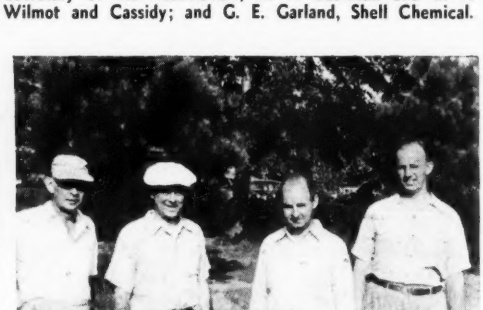
Salesmen Golf At Montclair

One hundred and twenty members and guests of the Salesmens Association of the American Chemical Industry fled the city heat July 19 to sock the little white bolus around the Montclair (N. J.) Golf Club. Herewith are some of the happy gladiators. Low gross and net prizes went to G. E. Garland and D. P. Jones, Shell Chemical; R. A. Kramer, Evans Chemetics; Frior Thompson, R. J. Prentiss & Co.; Russ Boland, Drug Trade News; and Morris Resnick, N. Y. Laboratory Supply Co.

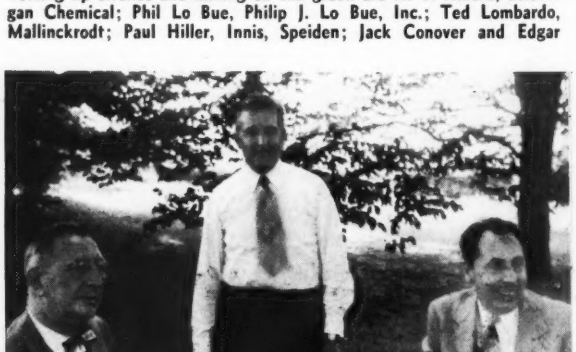
Maybe the name isn't Sammy Snead, but it was a lot of fun.

Smiles suggest good scores for (l. to r.) C. L. Brooks and A. H. Pflugh, Enjay Co.; Paul Slawter, Jr., House of J. Hayden Twiss and executive secretary of the Association; A. F. Cashman and L. F. Wentzel, Wilmot and Cassidy; and G. E. Garland, Shell Chemical.



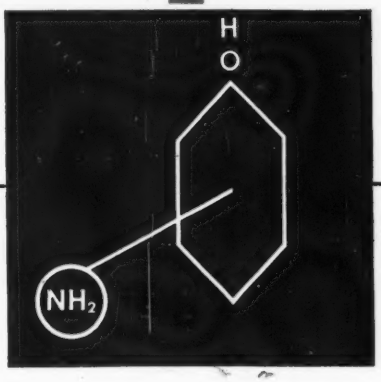


Totting up strokes and milling on the green are H. T. Hillard, Michigan Chemical; Phil Lo Bue, Philip J. Lo Bue, Inc.; Ted Lombardo, Mallinckrodt; Paul Hiller, Innis, Speiden; Jack Conover and Edgar Brand, L. Sonneborn Sons; Blythe Reynolds, Merck & Co.; J. P. Remensnyder, Heyden Chemical; Pete Reilly, Jr., Reilly Tar & Chemical; and G. S. Furman, Gane & Ingram.



F. O. Casseboom, Philip A. Hunt Co., W. F. Schumacher, J. T. Baker Chemical Co.; M. G. Folsom, Shell Chemical Corp.; A. B. Craig, Witco Chemical Co.; and G. T. Short, also of Witco, take it easy after a tough afternoon.

aminophenols



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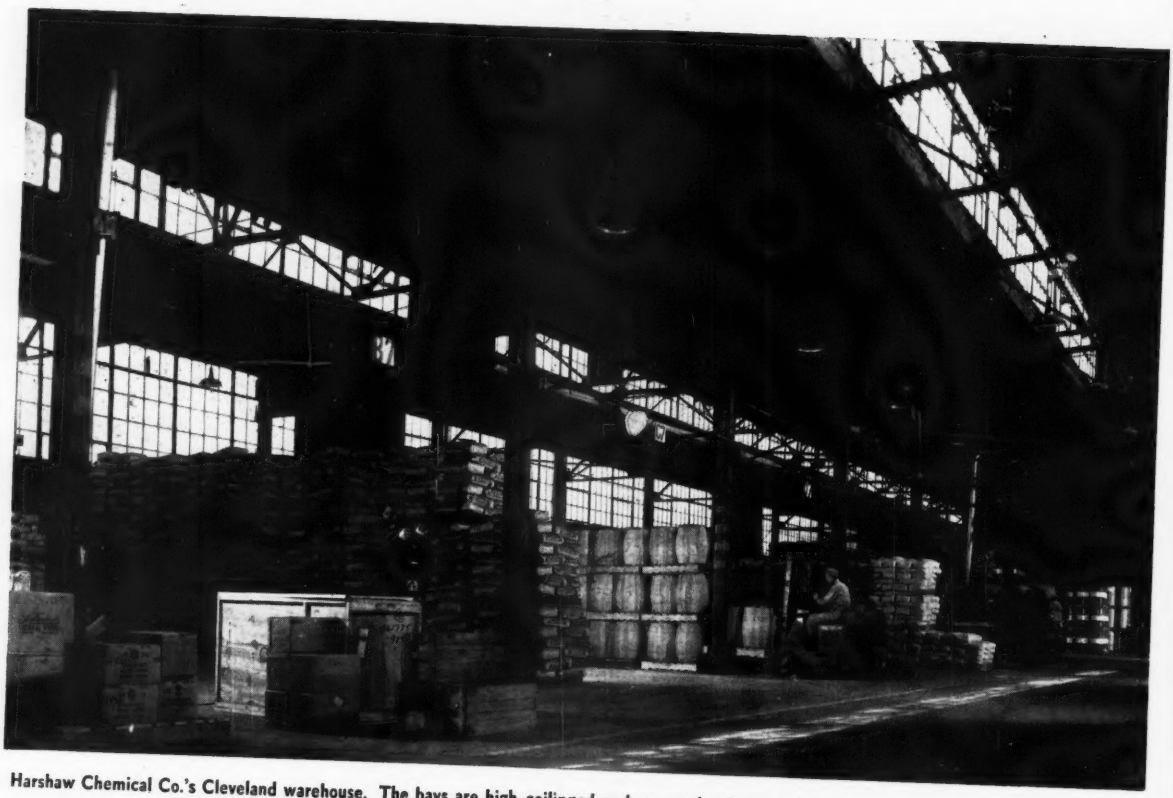
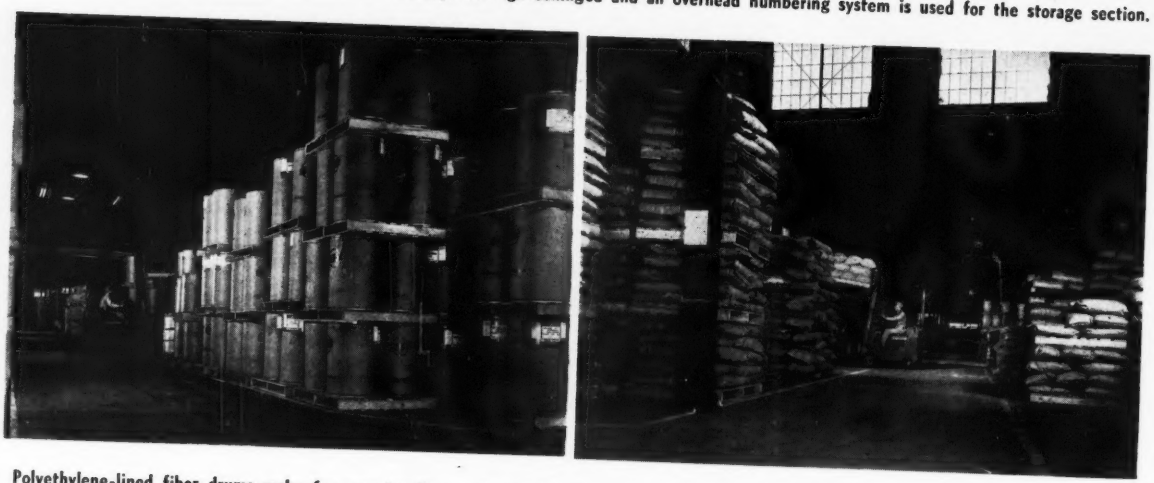
Harshaw Opens New Warehouse



Harshaw Chemical Co.'s Cleveland warehouse. The bays are high-ceilinged and an overhead numbering system is used for the storage section.



Polyethylene-lined fiber drums make for easy handling and stacking. The wide connecting aisles allow fast operation of the lift trucks.

The Harshaw Chemical Co. has recently opened its new chemical industrial warehouse at the corner of East 88th St. and Laisy Ave. It is reported to be one of the largest and best equipped in the country for efficient handling of industrial chemicals. Space covered is over 140,000 square feet, all on one floor.

Everything is handled on pallets by fork-lift trucks for quick shipment. The high ceiling makes possible piling four to five pallets with their loads.

The floor is lined in sections numbered overhead to facilitate location of goods from inventory records. This also simplifies the placing of stock by the lift truck operators.

On the south side, the warehouse is served by a side track from the New York Central Railroad which holds eight cars at a time.

A ramp on the northeast, corner permits trucks to drive directly into the warehouse. For shipping, platforms in the shipping room are level with truck body floors so that lift trucks can run into motor trucks to deposit the stock. Orders are assembled on pallets in the shipping room. Shipping and receiving locations are at opposite points of the building to eliminate confusion.

The main offices of the Harshaw Scientific Division and their central warehouse are contiguous to the warehouse for industrial chemicals and use the same shipping and receiving facilities.

What Your Customers Want to Know About

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QUATERNARY AMMONIUM COMPOUNDS

Question: Are quaternaries safe if used externally?

Answer: Yes. Patch tests with quaternary solutions in strengths up to .1% show no harmful effect to the skin.

Question: Are Onyx quaternaries toxic when used over a period of time?

Answer: In use dilutions, quaternaries have exceptionally low toxicity as shown by tests conducted over two years by an independent laboratory.

Question: Do quaternaries build up cumulatively harmful residues?

Answer: No. In use dilutions, tests have indicated no toxic build up internally even when quaternaries are used over extended periods of time.

Question: Won't quaternaries lose their efficiency in the presence of organic matter?

Answer: Yes. The rate of breakdown is much slower than that of other sanitizers, however, and there are no harmful side effects.

Question: What about shelf life?

Answer: Onyx quaternaries retain their effectiveness undiminished until they are used.

Question: Where are quaternaries now being used?

Answer: In restaurants, food processing plants, dairies, farms, hospitals, morturies; in textiles, etc.

Question: What quaternary ammonium compounds are available?

Answer: Onyx manufactures the following quaternary ammonium products:

1. "Onyx BTC*"—Alkyl dimethyl benzyl ammonium chlorides.
2. "Onyxide*"—Alkenyl dimethyl ethyl ammonium bromide.
3. "Isothan Q-15*"—Lauryl Isoquinolinium bromide.
4. "Tetrosan"—Alkyl dimethyl 3,4-dichloro-benzyl ammonium chlorides.

*Registered Trade Mark.

Onyx quaternary ammonium compounds have rapidly been supplanting other sanitizers because they are easy to apply, low in cost, free from objectionable color and odor, and low in toxicity. They have unique deodorizing properties and can be combined with other detergents and builders.

Yet, like many new developments, there are certain pertinent facts about Onyx quaternaries which are not universally understood. Answers to these questions explain why so many Onyx customers are profiting by making these chemicals of opportunity part of their processed products.

In order to answer many technical questions similar to these, Onyx has recently prepared a new thirty-two page booklet entitled "Onyx BTC". A copy is yours free for the asking. Simply fill out and mail the attached coupon.

Please send us a copy of your new booklet entitled "Onyx BTC".

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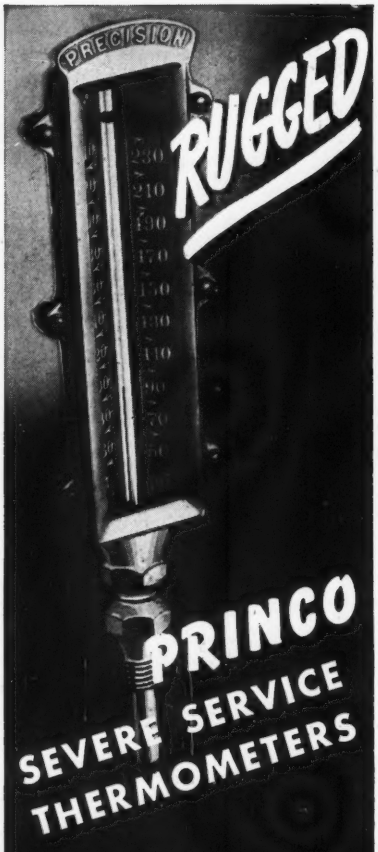

Here are the "PRINCO" Thermometers for those really TOUGH service conditions. Cases are extra heavy castings, specially designed for maximum strength. Frames and cases are BOLTED together. Glasses are extra heavy plate to withstand shock and vibration. Cases completely sealed against fumes and moisture. Built-in dehydrator prevents fogging or condensation. Extra protection for mercury tubes assures maximum service life.

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A new research building was the last unit to be completed of G. D. Searle & Co.'s expansion program at Skokie, Ill., suburb of Chicago. The 125′ x 340′ one-story building consists of two wings, one devoted to organic research, the other to biological research in the fields of physiology, endocrinology, pharmacology, bacteriology, biochemistry and related sciences. The library (*above*) is soundproofed and has two glass-enclosed nooks at one end for concentrated study. Other units completed during the current expansion are a pharmaceutical building which houses the company's granulating, tableting, coating and liquid departments; two chemical manufacturing buildings; a warehouse; and a power plant.

Fiberglas on Pacific Coast

Part of the Owens-Corning Fiberglas Corp.'s new $7 million Pacific Coast plant at Santa Clara, California. The two black stacks in the foreground are for the main boiler section. The large white stack is for the furnace in which the glass batch is melted. Fiberglas insulation products are made here for distribution in all of the states west of the Rocky Mountains. Nine buildings comprise the plant.

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CHEMICAL SPECIALTIES

Chemical Requirements of The Laundry Industry

by RICHARD B. MITCHELL
American Institute of Laundering
Joliet, Illinois

SALES OPPORTUNITIES for chemicals and proprietary compounds can be exploited in the laundry industry—a $37 million customer in 1948.

WHILE the present day laundry had its beginning in the early nineteenth century, the art of laundering antedates the discovery of soap. The basic principles of laundering have not changed materially through the years; however, refinements in equipment, chemicals, and methods have resulted in the establishment of an almost new industry.

An idea of the size and growth of the industry may be gained from the fact that the annual sales in 1933 were $296 million, as compared to $971 million in 1948. In 1948 the industry spent approximately $37 million for the purchase of process chemicals (excluding water).

It is the purpose of this article to survey the requirements of the industry for chemicals. Unfortunately, specific statistics are not available for the individual poundage of chemicals used. The consumption figures presented are in value purchased, as based on an operating costs survey by the American Institute of Laundering in 1948.

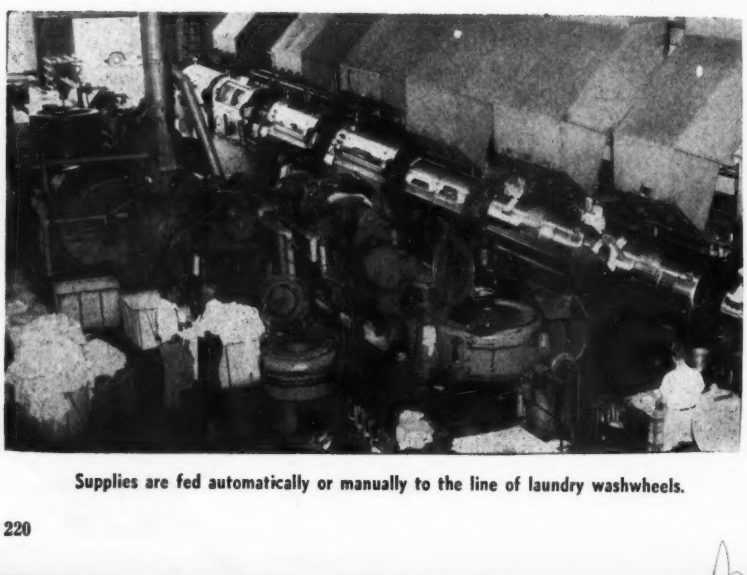
WATER

Since water is the predominant phase in the detergent process, it is both economically and theoretically advisable to maintain a supply free from soap consuming constituents. Although no hard and fast rule can be set up to dictate when it is necessary to install water softening equipment, a zeolite-type softener will pay for itself in a relatively short period of time with waters of over 2 grains (as $CaCO_3$) hardness. In cases where synthetic detergents are employed, a wider latitude of control is possible. However, because most laundries operate their own power plants, some type of boiler-water conditioning treatment is normally used.

In most cases, laundries make use of the zeolites or zeolitic materials in the softening operation. In a few instances the lime-soda softening process is in operation. In 1948, approximately $1.7 million was spent by commercial laundries for water softening supplies. Included in this expenditure would be such chemicals as salt, natural or synthetic zeolites, unslaked or hydrated lime, sodium aluminate, soda ash, and perhaps some caustic soda, calcium sulfate and sulfuric acid.

In addition to the external water softening process, some laundries find it necessary to use an internal chemical treatment of the boiler water. Although it is well established that no one particular chemical either as such or in proprietary mixtures can be considered as a panacea, probably the sodium phosphates are most generally employed for the precipitation of soluble calcium salts in the internal treatments. In addition to the mono-di-, and tri-sodium phosphates, it is usually necessary to add such organic chemicals as are required to maintain the resulting sludge in a fluid form.

It has been stated that the maximum allowable iron content for laundry waters is 0.2 ppm. In general, most plants are not in a position to install corrosion resisting metals or alloys. Accordingly, in many cases, it becomes necessary to employ methods designed to minimize corrosion of iron pipe. At the present time, the use of a liquid silicate treatment to coat the inside of the pipes is rather widely accepted.



Supplies are fed automatically or manually to the line of laundry washwheels.

DETERGENTS

The sodium soaps still are the most

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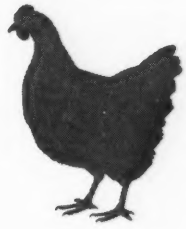

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generally used detergents on a poundage basis in the actual washing process. Of course, these soaps may have either an animal or vegetable fat or oil base, but the majority of the soaps used in the laundry are derived from inedible tallow. While the titer of these soaps will vary according to the fat from which the tallow was obtained, they are usually designated as high (38° C. and above) titer soaps and as such are used mainly for laundering white fabrics at temperatures ranging from 140 to 160°F. The medium and low (20° C. and under) titer soaps are used mostly for laundering colored fabric classifications which generally require lower washing temperatures. For the most part, the industry usually purchases its tallow soap on an 88% or 92% total soap basis.

Proprietary built soaps are those mixtures which contain various proportions of soap and alkali. At the present time, these products are enjoying wide acceptance by the industry. Table I contains a number of representative analyses of such products.

TABLE I—COMPOSITION OF TYPICAL BUILT SOAPS

	Percentage Composition			
Product	*A*	*B*	*C*	*D*
Ingredients				
Soap	56	33	25	67
Soda Ash	31	30	60	12
Silicate	3	13	..	6
Caustic Soda	..	..	4	..
Moisture	10	24	11	15

Because of the difficulties resulting from formation of lime (calcium and magnesium) soaps, and because of the tendency of soaps to hydrolyze, synthetic detergents in some instances are approaching soap in adaptability to commercial laundry use. In most cases, synthetics are sold to the laundry in the form of proprietary mixtures similar to the built compounds involving soap. Representative analyses of a few of these materials are given in Table II.

TABLE II—COMPOSITION OF TYPICAL BUILT SYNTHETIC DETERGENTS

	Percentage Composition		
Product	*A*	*B*	*C*
Ingredients			
Synthetic Detergent	29	23	38
Sodium Sulfate	65	77	53
Phosphates	6	..	9

The more adaptable synthetics are the anionic materials, although the nonionics are gaining in recognition and acceptance. The cationic compounds have found rather limited use in the laundry industry at the present time. Apparently the choice of a synthetic over soap is determined primarily by the relative market price of the materials. The more progressive laundries however, are actively investigating the actual merits and benefits to be derived from the use of synthetics as compared to those associated with soap.

Probably the synthetics enjoying the greatest usage in the laundries today are the sulfates and sulfonates. Successful results have been reported by laundries using alkyl sulfates and sulfonates as well as alkylaryl sulfonates. In most cases these products have been used in conjunction with the so-called alkaline build-

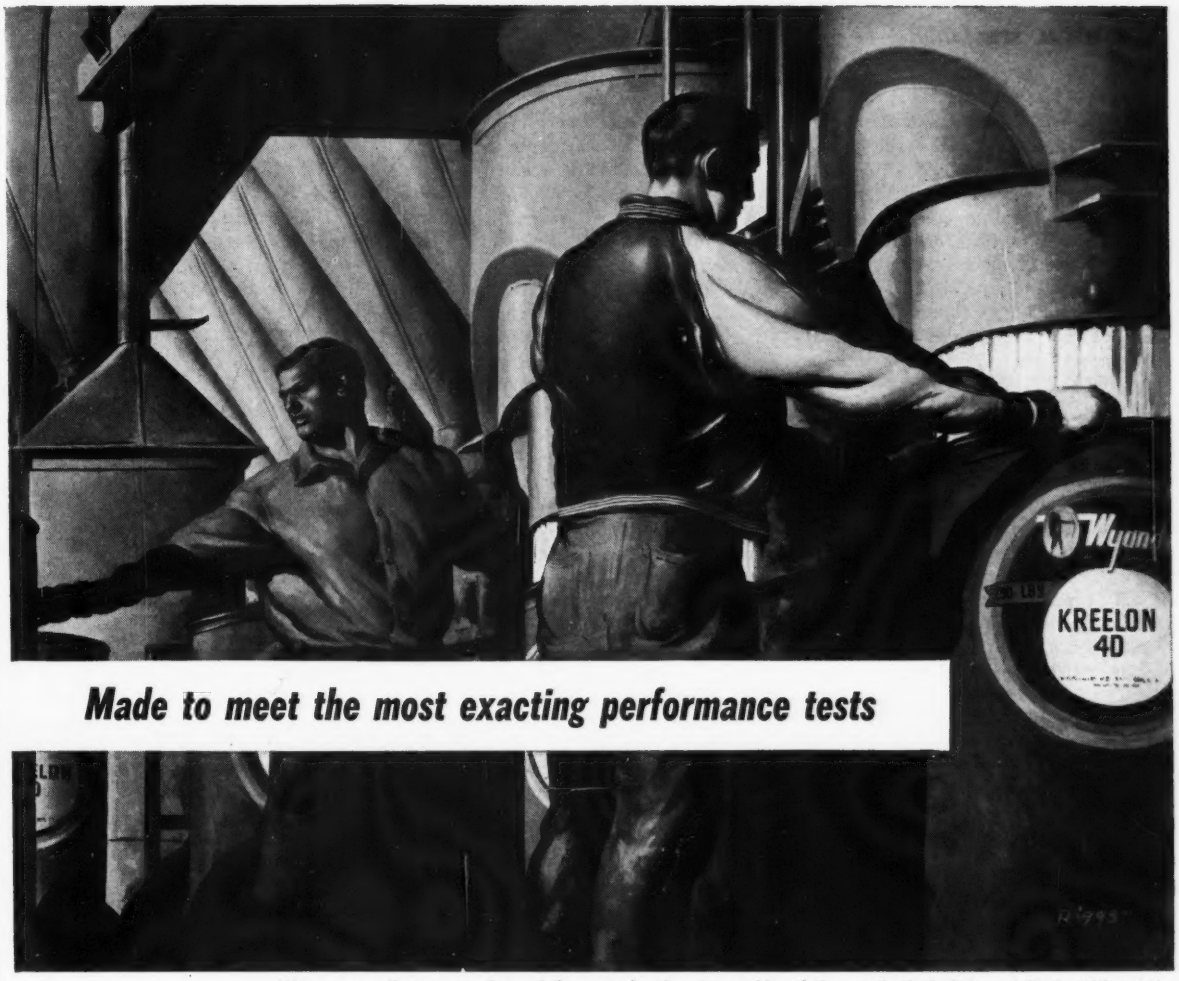
Making up stock built soap solution which will be fed subsequently to washwheels.

ers—generally sodium salts of weak inorganic acids. Despite their low-foaming properties and other psychological disadvantages, these "promoted" alkylaryl sulfonates have won acceptance because of high level performance on white and colored cottons, and economies resulting from their cold water solubility and the shortened formulas they make possible.

Some of the non-ionics, particularly polyethylene oxide compounds and their derivatives, are reported to show better detergency, at least on a laboratory scale, with cotton than have some of the anionics. In the washing of fugitive colors, the cationics are capable of minimizing contact dye stains, but unfortunately some of these materials lack detergency of a sufficient degree to warrant their continued use.

For laundering diapers or hospital operating linen and in the prevention of mildew, the quaternary ammonium salts, because of their bactericidal powers, may be used advantageously. However, in this respect, the effects of bleach, sour, and hot pressing are in themselves sufficient to produce satisfactory laundering as far as bactericidal efficiency is concerned.

In hard water areas, and for the low temperature (100° F.) washing of colored fabrics, the synthetics are more versatile than soap. Because wool will selectively absorb alkali from a soap-alkali



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Here you see the conveyor line and the great, looming storage bins of the new Synthetic Detergent Plant at Wyandotte

WYANDOTTE KREELON—*the white, uniform detergent and wetting agent*

If you produce cleaning compounds or other products that call for an effective synthetic organic detergent, you'll find the answer in *Wyandotte Kreelon**. Or if some operation in your plant requires an unusual amount of time and labor in the wetting-out process, chances are that Kreelon can help you do a *better job, faster.*

This versatile chemical, broadly classified as a surface-active agent, is designed to meet rigid performance specifications. Initial production of Kreelon was delayed for months until the product's color, chemical analysis and performance measured up to the highest standards. Controlled production maintains these standards.

The three grades of Kreelon produced range from *white* to *light cream* in color and have only a faint characteristic odor. Equally important is the fact that they retain their wetting, sudsing and cleansing properties in acid, alkaline or neutral solutions — in hard or soft waters.

Wyandotte Kreelon is readily available and economically priced. Complete information on its properties and suggested uses will be furnished at your request. In addition, our experienced technical staff stands ready to assist you in solving many detergency problems.

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BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE • CHLOROETHERS
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

Wyandotte
REG. U. S. PAT. OFF

solution, the true synthetics as distinguished from synthetic-alkali mixtures offer a distinct advantage for the washing of woolens.

During the war, the laundry owner often was forced to use then so-called synthetics in order to continue in operation. Some of these get-rich-quick products left a bad taste in his mouth; however, the industry can be considered as a potential user for relatively large amounts of synthetics.

BUILDERS

In 1948, $25.7 million was spent by the industry for soap (including synthetics) and laundry builders. In laundry parlance, the term builder indicates an alkaline compound which will function as follows:

1. Neutralize acidity of the soil on fabrics.
2. Sequester or otherwise minimize the action of the water hardness constituents in the soil.
3. Inhibit soap hydrolysis.

This is by no means a complete list of the functions usually associated with builders. However, it can be seen that builders are in reality less expensive materials that extend soap by performing some of the functions that soap would have to do if used alone. In addition, a soap-builder mixture will normally have greater detergent powers over either of the two separate components.

A literature search relative to soap builders will result in leaving the searcher in a state of gibbering confusion in regard to the general efficacy of a given builder. From the standpoint of the sales angle it appears that a given proprietary compound having the best physical characteristics — non-caking, free flowing, readily soluble, free rinsing, and last but by no means least, non-irritating to the washman's hands or respiratory system— will enjoy widespread acceptance.

In regard to the builders being used in the laundry industry, the following is a partial list of such chemicals, offered without any attempt to rate them in any order of ascending or descending efficacy: caustic soda; soda ash; silicates of almost any conceivable $Na_2O:SiO_2$ ratio such as $Na_2O.SiO_2$, $2Na_2O.SiO_2$, and $3Na_2O.2SiO_2$; sodium sesquicarbonate; modified soda; practically all of the sodium phosphates such as pyro, ortho, tripoly, hexameta; and sodium tetraborate (of lesser importance).

Most of the above builders are used primarily with soap although several are incorporated in synthetic mixes. The neutral inorganic salts such as sodium chloride or sodium sulfate are used particularly with synthetic detergents. Although some of these chemicals are bought in the form of proprietary mixtures a great many laundries prefer to buy the individual chemicals, mixing them to fit the occasion. Representative analyses of a few of the proprietary builder mixtures are given in Table III.

TABLE III—COMPOSITION OF TYPICAL PROPRIETARY BUILDER MIXTURES

	Percentage Composition	
Product	*A*	*B*
Ingredients		
Soda Ash		2
Phosphates	40 (hexameta), 15 (tri-sodium)	1 (pyro)
Silicates	40 (meta)	92 (ortho)
Caustic Soda	5	....
Inert	.....	5

The sodium alginates and in particular, sodium carboxymethylcellulose, are rather widely used in the form of builders for anionic synthetics. These materials have the capacity of preventing or reducing the redeposition of solid soil once it has been removed from the fabric.

In the laundering of greasy materials such as mechanics' overalls, it is common practice to use bentonite or an equivalent clay as a builder for both synthetics and soap. These clays because of their

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- *Improving affinity of dyestuffs*
- *Protecting dyestuffs from action of copper equipment*
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- *Formulating adhesives and animal glues*
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For maximum dryness, Koppers Ammonium Thiocyanate is now shipped in barrels lined with polyethylene plastic. Polyethylene's unusual resistance to moisture penetration *prevents water absorption.* And this polyethylene liner is tough and durable for long-lasting protection.

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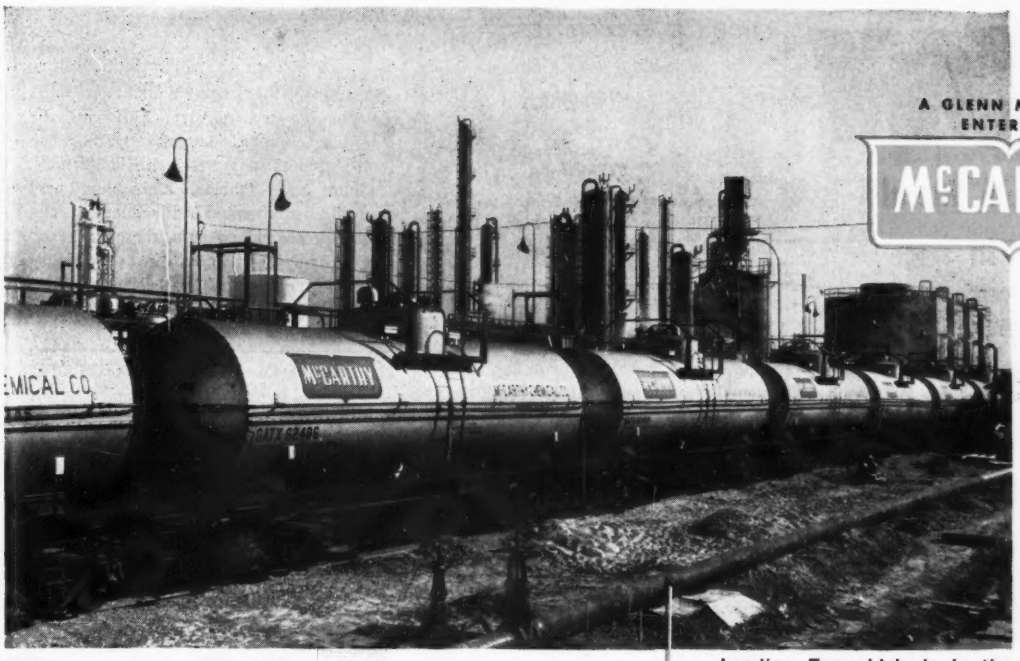

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McCARTHY

Loading Formaldehyde in the 10,000 gallon tank cars operated by McCarthy. Each car is especially lined and insulated.

Time to Talk '50 with McCarthy

Chemical process industries are planning ahead, checking 1950 contract needs, looking to the McCarthy Chemical Company to meet those requirements from the predictable volumes of primary and intermediate chemicals flowing today from the new McCarthy unit at Winnie, Texas.

Assured supplies of petro-chemicals are made possible by the unique McCarthy "flow-chart" — a production cycle that begins and ends with McCarthy-owned and operated facilities and resources that provide unlimited reserves of natural gas, a supervised gathering system and the fully controlled processing of hydrocarbons.

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- **37% Inhibited Formaldehyde**
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- **Propane**
- **Acetaldehyde**
- **Fuel Oils**
- **Butane**
- **Gasoline**
- **Kerosene**

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McCarthy producing companies are planning ahead with industry, exploring New Horizons in Hydrocarbons through more economical, more efficient processes, conserving more and more of our valuable natural resources by converting yesterday's wastes into today's valuable raw materials.

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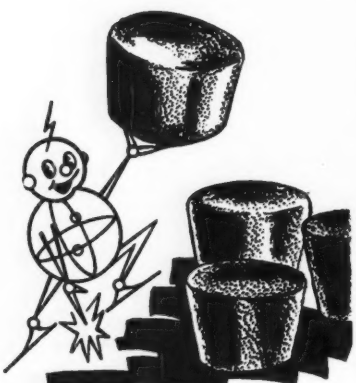

METALLOY SCORES ANOTHER FIRST!

Lithium metal—in the convenient form of 4 oz. cups—is Metalloy's most recent contribution to the industry. Shaped exactly like a muffin, the new cup is easier to handle than the lump or ingot form. It is available at no extra cost.

Metalloy has always endeavored to be more than just a supplier of Lithium. By constant research and close contact with industry, Metalloy has continued to develop new physical forms of Lithium and its compounds. For example, we pioneered Lithium metal in the the form of wire, sand and shot. The new cup form was developed at the request of volume users in the synthetic organic chemical field who require a more convenient form than has been available.

As a further contribution to organic research, our technical staff has prepared an Annotated Bibliography on the use of Organolithium Compounds in Organic Synthesis which is available to research workers.

In addition, data sheets are available on Lithium metal in the form of lump, wire, rod, shot and cups.

METALLOY CORPORATION
Rand Tower Minneapolis, Minn.
DIVISION LITHIUM CORPORATION OF AMERICA INC.

emulsifying properties may also be classified as detergents.

BLEACH

The industry, during 1948, spent about $6.5 million for the purchase of those chemicals classified as bleach, sours and blue.

The bleaching operation in washing white fabrics is used to eliminate the slight yellowish cast that the cloth attains during normal laundering process. In addition, bleach will also remove certain types of stains. The industry recognizes two types of bleaches: reducing and oxidizing.

Reducing bleaches comprise such chemicals as sodium hydrosulfite (correctly—sodium hyposulfite, $Na_2S_2O_4$) and sodium sulfite. These bleaches, in general, are not used in the actual laundering process, but are relegated mainly to the role of strippers for stain (dye) removal. The quantity used by the industry is relatively small compared to the oxidizing bleaches.

The oxidizing bleaches may be sodium hypochlorite, hydrogen peroxide, or sodium perborate. The bulk of the bleach used today by the industry is of the hypochlorite type, often purchased in solution form containing about 14% available chlorine and a small percent of caustic soda. In use, the carboy bleach is diluted to a 1% available chlorine content and applied at the rate of 2 quarts of solution per 100 pounds of fabric (white only).

Many laundries prefer to buy their bleach in the form of bleaching powders or the high test hypochlorites. The bleaching powders contain calcium hypochlorite as the active ingredient. The high test hypochlorites have a calcium hypochlorite content of approximately 75%. In order to prepare aqueous bleach solutions it is necessary to use either soda ash or modified soda to remove the calcium. A few laundries prepare their bleach solutions by using liquid chlorine and caustic soda in a water solution.

SOURS

In view of the fact that most natural fibers tend to selectively absorb alkali, and since many laundry waters have a high bicarbonate content, it is necessary to neutralize this alkalinity by the use of a sour in order to prevent subsequent discoloration of the fabrics during the ironing procedure. From the chemical point of view, sours, as the name implies, are weak organic acids or acid salts. They are used in concentrations such that will afford a pH of approximately 5 for the aqueous solution in question. At such a concentration their effect upon the tensile strength of cellulose fibers is negligible.

As a group, the silicofluoride materials are used in the largest amounts as sours by the laundry industry. Following are the more common chemicals in this group considered as sours: sodium silicofluoride, sodium acid fluoride, ammonium acid fluoride, ammonium silicofluoride and zinc silicofluoride. Again, these materials are usually purchased in proprietary mixes as exemplified by the compositions in Table IV.

TABLE IV—TYPICAL LAUNDRY SOURS MIXES

Product	*Percentage Composition* A	B
Ingredients		
Zinc Silicofluoride	..	98
Sodium Acid Fluoride	96	..
Miscellaneous	4*	2†

* Poly phosphate.
† Sodium chloride and water.

In addition, acetic, formic, lactic, and a relatively newcomer in the field, gluconic acid, also may be used as sours.

BLUES

White fabrics which have been in use for some time and have been subjected to repeated laundering tend to develop a yellowish cast. Certain shades of blue will neutralize this color, and the materials so used are designated as blues. The majority of blues used by the industry are organic dyestuffs. Such products as indigo, cobalt blue, ultramarine, and prussian blue may be used for this purpose, although the actual amounts involved are relatively small.

In connection with blues, the latest innovation is the use of fluorescent compounds for producing whiter and brighter laundry. These substances, generally referred to as optical bleaches, are capable of converting ultraviolet energy into visible light. This light returning to the eye in addition to the normal light reflected from the fabric gives an apparent increased reflectance—apparent because the phenomenon is at a maximum only under a sufficient source of ultraviolet energy. When the fluorescent agents are used on colored fabrics containing white areas or on printed materials, the effect is one of contrast. The materials differ from blues in the respect that bluing usually decreases the total reflectance of a fabric.

These optical bleaches apparently are outgrowths of I. G. Farben's Blankophors. In general, it is believed that the present products are triazine or stilbene derivatives; in one case, 7-hydroxy-4-methyl coumarin is the active ingredient. The industry is now using the products in an increasing amount.

STARCH

Starching as applied in the laundry

(*Turn to page 297*)

Antara Products
General Aniline & Film Corporation

Antara Extra

An Antara Products Publication

Detergents
Emulsifiers
Wetting Agents
Dispersants
Carbonyl Iron Powder

444 MADISON AVENUE NEW YORK 22, N. Y. AUGUST, 1949

Iron Pentacarbonyl Now Offered By Antara Products

Iron Pentacarbonyl, long produced by General Aniline & Film Corp. at its Grasselli plant solely for further processing into Carbonyl Iron Powders, now is available for sale as a chemical product.

Made by the reaction of iron-containing ores with carbon monoxide, Iron Pentacarbonyl ($Fe(CO)_5$) is a viscid, yellow liquid. It has a specific gravity of 1.466 at 18°C. and a boiling point of 102.8°C. (749 mm.). $Fe(CO)_5$ is soluble in nickel tetracarbonyl and in most organic solvents. It is insoluble in water.

Produced at the Carbonyl Iron Powder plants of General Aniline & Film Corporation in Grasselli, N. J. and Huntsville, Alabama, Iron Pentacarbonyl is available for immediate shipment in commercial quantities.

According to Antara Products, the chemical should be extremely interesting to researchers in many fields, especially those in organic synthesis work. Working samples are available to interested companies.

Researchers who want to investigate the possibilities of Iron Pentacarbonyl in their products or processes are invited to write to Antara Products, outlining their specific problems.

Of further interest to researchers, are the Carbonyl Iron Powders which are produced by heating the liquid Iron Pentacarbonyl to a temperature where it decomposes into iron in powdered form, liberating carbon monoxide. The results of this method are unique in that the iron powder particles formed by its decomposition are spherical and free of non-ferrous materials.

Until recently, practically all of the Carbonyl Iron Powders produced by General Aniline & Film Corporation went into the electronics industry for the manufacture of high frequency cores. The recent opening of the Huntsville, Alabama plant now makes possible the shipment of Iron Pentacarbonyl and Carbonyl Iron Powders to other industries.

Many Powdered Products Now Being Manufactured with Liquid Non-Ionics

Household Cleaners Easily Formulated with Odorless Antarox "A-400" & "A-480"

Two recently-introduced Antara Products' detergents – Antarox "A-400" and Antarox "A-480" – foaming, essentially odorless, synthetic, non-ionics are being used to good advantage in the compounding of many different types of household cleaners.

Among the products that these versatile non-ionics have helped companies compound and introduce to the market are: (1) an all-purpose household cleaner (2) a paint and woodwork cleaner (3) a floor cleaner (4) a dairy cleaner and (5) a car wash.

Antarox "A-400" and "A-480" are aromatic polyglycol ethers. Essentially odorless features make them particularly valuable for the compounding of household cleaners.

These two products are extremely stable in the presence of acids, alkalis and electrolytes. They do not ionize, will not form insoluble compounds in hard water. They do not easily decompose or separate and will withstand wide variations in temperature. They have remarkably long shelf lives.

If you have a household cleaner in mind, let us help you formulate it. Write for more information today.

Many new detergent compositions, heretofore, impossible to compound, now are being manufactured with liquid, non-ionic detergents of the Antarox "A" series by means of a simple, low-cost mixing process developed recently by the Central Research Laboratory of General Aniline & Film Corporation.

New formulations, long in the development stage, make it possible to incorporate the advantages of non-ionic synthetic detergents into these compositions. Among these advantages are non-sneezing and odorless powders of excellent detergency in hard or soft water.

A further advantage of the new process is that it enables compounders of soap and detergent products who lack expensive spray- or drum-drying equipment to use these versatile, efficient and economical detergents for better cleaners at lower costs. The simplicity of the mixing process makes this possible.

The liquid, non-ionic detergents of the Antarox "A" family are aromatic polyglycol ethers. They are excellent detergents, wetting agents, dispersing agents and emulsifiers. Because they do not ionize they will not form insoluble compounds with hard water. They are extremely stable and will not easily decompose or separate over long storage periods.

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SPECIALTIES NEWS

Lever Building Plant On West Coast

A $25 million plant to produce soap, glycerine, detergents, margarine and shortening will be built in Los Angeles, Cal., by Lever Bros. Co. In breaking ground for the new project last month, Charles Luckman, president of the company, stated that it is part of a $55 million expansion.

The new plant's production will be distributed in Western states, hitherto supplied by Lever plants in the Midwest and East.

Lindane Approved for Dairy Fly Control

The U. S. Department of Agriculture has approved the use of lindane (the essentially pure gamma isomer of benzene hexachloride) as a residual fly spray for dairy barns. This action had been anticipated because of excellent experimental results obtained in such applications and the low chronic toxicity of the material (*CI, July 1949, p. 32*).

The name "lindane" was just selected by the USDA to describe the pure gamma isomer containing not over one per cent of the other isomers or impurities because of confusion over grades of benzene hexachloride of varying gamma isomer content. Complete information on the properties and suppliers of the newly named material can be found in the story, "666 is 99.8" (reference noted above).

FTC Ends Hearings On Floor Wax Rules

The wide divergence of opinion between government and industry on the necessity for trade practice rules for the floor wax products industry was emphasized at the final hearing before the Federal Trade Commission last month. There was almost complete unanimity on the part of the approximately 40 industry members on two points. First, they felt that there is insufficient evidence of bad trade practices in the industry to warrant the formulation of trade practice rules. Secondly, if trade practice rules are to be imposed upon the industry, they should be more workable than the rules discussed at the hearing.

At a trade practice conference in New York in September, 1948, members of the industry drew up a set of rules for consideration by the FTC. However, a number of those present at the final meeting stated that the Commission's proposed rules embodied few, if any, of the industry's suggestions. The FTC will take under consideration the views presented at the conference as well as letters, memoranda and briefs, and then proceed to final action on the proposed rules.

It was the consensus of those present that the Commission's definition of wax would have to be altered in many respects to bring it into conformity with the industry's definition of this product. Various suggestions were made as to a definition which would embrace the synthetic products which have been developed.

Almost unanimous objection was made to the proposed definition of "industry products" as being too broad. The industry feels that manufacturers of competitive protective coatings should be brought under any rules formulated for the floor wax industry.

Lethane Receives USDA OK For Aerosols

Lethane 384, an insecticide concentrate manufactured by Rohm & Haas Co., Philadelphia, and used widely in household and industrial sprays, may now be employed as one of the ingredients for household aerosols. Approval by the Bureau of Entomology of the U.S.D.A. follows extensive investigations into the performance and relative toxicity of an aerosol containing Lethane, pyrethrins and DDT.

It is reported that the new formula essentially the same, entomologically and toxicologically, as the standard U.S.D.A. household type insecticide aerosol, offers the manufacturer substantial savings in raw material costs. Interested firms are being referred to the U.S.D.A. for license under Patent No. 2,231,023 to manufacture aerosols according to the new formula.

AS&GP Broadens Membership

The Association of American Soap & Glycerine Producers, Inc., has broadened its membership to include manufacturers of synthetic glycerine and of synthetic detergents. This action was voted recently by the Board of Directors at a meeting in New York City.

Group Hits DDT Scares

Disputing widely circulated "scare" statements which have alarmed and misled the public into the belief that any use of DDT is hazardous to health, the National Better Business Bureau has declared that "there is no reason why properly labeled household insecticides containing DDT should not be advertised and sold to the public." The Bureau's statement was issued to allay fears which have led some manufacturers, retailers and other distributors to withhold needed supplies of DDT from sale, according to Allan E. Backman, NBBB editor of "Do's and Dont's in Advertising Copy" and was published in a July supplement to that publication.

K. B. Willson, NBBB operating manager, recently asked the principal government agencies concerned with the use of DDT in the nation's health and economy whether it offers any health risk if properly used. The government scientists were also asked whether they knew of any reason why adequately labeled household insecticides containing DDT should not be advertised and sold to the public. They know of no such reason and, on the contrary, deplore the fears that have been needlessly raised.

C. R. Payne (left), elected president of the Electro-Chemical Supply and Engineering Co., Paoli, Pa. in a complete reorganization of the company, and Allan L. Barnum, named New England district sales manager, Sharp & Dohme, Inc., to succeed William P. Walsh who has retired.

Salt-Marsh Caterpillar Controlled by Toxaphene

Dusts and sprays based on toxaphene are the first to give good control of the salt-marsh caterpillar. A new four-page leaflet about the use of toxaphene against these familiar insect pests is now available from Hercules Powder Co., Wilmington.

According to a U.S.D.A. report, dust mixtures containing 15% toxaphene and 5% DDT were used against the salt-marsh caterpillar on cotton in Arizona when a major outbreak occurred there. Thousands of dead caterpillars were found in the treated areas. Until the advent of toxaphene, no control method that was entirely satisfactory had been found.

Neomycin May Control Tuberculosis

Current studies on the *in vitro* and *in vivo* tuberculostatic action of neomycin, a new antimicrobial agent, by Gladys L. Hobby and associates of the biological laboratory of Chas. Pfizer & Co., Inc., indicate that it is capable of exerting an antimicrobial effect against both Gram-positive and Gram-negative microorganisms, as well as against streptomycin-sensitive and streptomycin-resistant strains of M. tuberculosis. The frequency with which organisms resistant to the action of streptomycin emerge during therapy is one of the major drawbacks to the use of streptomycin in the treatment of tuberculosis.

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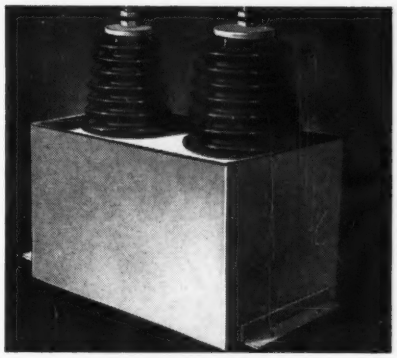
THE NAME TO WATCH IN CHEMICALS

IMPROVE ELECTRICAL INSULATION WITH ORONITE POLYBUTENES

These hydrocarbon polymers are especially important where electrical insulation material must withstand high operating temperatures. The high dielectric strength, low power factor and stability of Oronite Polybutenes make them extremely useful in this field.

Polybutenes are available in eight grades of viscosity to meet specialized conditions. They can be mixed with many elastomers, resins, asphalts, pigments and adhesives.

If your product calls for moisture resistance, tackiness, flexibility, bodying or non-drying properties, it may pay you to get the facts on Oronite Polybutenes.



Improved insulation of electronic capacitators is a typical example of the manufacturing advantages offered by Oronite Polybutenes. The addition of this outstanding product helps reduce breakdowns due to atmospheric oxidation, humidity, voltage fluctuations and elevated operating temperatures. Here again, the high dielectric strength, stability, low power factor, high viscosity and flexibility of Oronite Polybutenes prove of vital importance in the field of electrical insulation.

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Detergent Plant for Sweden

AB B Bergstrom & Co., Stockholm, Sweden—Scandinavian representative of Oronite Chemical Co., Calgon, Inc., Pennsylvania Salt Manufacturing Co., and Pittsburgh Plate Glass Co.—will build an alkyl aryl sulfonate plant at Gnesta, Sweden. It will use American technology through the collaboration of Oronite, whose Alkane will be the raw material. The dollar shortage has been given as the reason for the manufacture of this detergent which was previously imported.

Companies

In a reorganization of the Michigan Chemical Corp. sales activities, the Phillip J. LoBue Co. will combine its staff with that of Michigan Chemical. Phillip J. LoBue, president of the company that bears his name, will be responsible for the domestic sale in the East of Michigan Chemical's organic and inorganic bromides, pharmaceuticals and industrial chemicals, as well as its "Pestmaster" line of DDT insecticides. He will operate out of Michigan Chemical's present offices at 230 Park Ave., New York City, until arrangements for new quarters are completed. In other personnel assignments, L. W. Gopp will be in charge of direct export sales for Michigan Chemical and will cooperate with Mr. LoBue on export sales through domestic exporters.

American Cyanamid Co. has completed a new parathion unit at its Warners, N. J., plant and can now assure adequate supplies of technical grade Thiophos Parathion.

Outlook in the private formula drug and chemical manufacturing business is bright, according to Joseph V. Sterba, president of Savoy Drug & Chemical Co., in his report to the Board of Directors covering operations for the fiscal year, July 1948 through June 1949. Sales by Savoy totaled $998,743 in the period, a rise of 22 per cent over the previous fiscal year.

In response to state and federal governments and private industry requests for a DDT insecticide to control the spruce budworm at a cost of not over $2 per acre, The Pennsylvania Salt Manufacturing Co. of Washington developed a formula enabling an over-all project expenditure of $1.07 per acre. More than 260,000 acres were sprayed in Oregon and a 95% mortality of larvae of the budworm was achieved. Next year it is estimated that half a million acres of Oregon timber land will be sprayed.

The Biological Testing Laboratories of Julius Hyman & Co., Denver, Colo., have recently acquired a modern new home which comprises eight rooms and has approximately 2,800 square feet of floor space.

A new "Government Service Department" to coordinate information, sales and service to federal, state and municipal governments has been set up by Antara Products, General Aniline & Film Corp. A complete file of government specifications applicable to Antara Products has been set up by the new department which also has complete facilities for streamlined bidding and prompt, adequate service in the surface active agent field.

Personnel

• Edmond G. Young has been placed in charge of sales of "Freon" fluorinated hydrocarbon propellants by **Kinetic Chemicals, Inc.** He came with Kinetic last year after spending four years in fluorine chemistry research in the Du Pont Company's Jackson Laboratory.

• U. V. Solmssen has been appointed assistant director of research of **William R. Warner & Co., Inc.** and affiliated

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DRYMET*

The Economical Detergent Silicate

Cowles DRYMET, anhydrous sodium metasilcate, is the most highly concentrated form of sodium metasilicate available. It is more economical to use, on the basis of both Na_2O (alkalinity) and SiO_2 (silicate) than any other type of hydrated or anhydrous detergent silicate, either compounded or by itself. DRYMET contains no water of crystallization.

CRYSTAMET*

The Medium pH Detergent Silicate

Cowles CRYSTAMET is a pure, perfectly white, free-flowing granular pentahydrate sodium metasilicate with the normal 42% water of crystallization. Suggested for compounding when it is desirable to lower the concentration of a finished product. Readily soluble — chemically stable — easy to handle. Can be used on medium pH jobs.

DRYSEQ*

The All-Purpose Detergent Silicate

Cowles DRYSEQ, anhydrous sodium sesquisilicate, is a medium pH alkaline cleaner which will do fast, dependable work at a low cost to the user. It is a white, free-flowing powder, quickly and completely soluble in hot or cold water—containing 56.75% Na_2O—making it an economical base material for compounding.

DRYORTH*

The Heavy-Duty Detergent Silicate

Cowles DRYORTH, anhydrous sodium orthosilicate, is a powerful, speedy, heavy-duty cleaner with valuable penetrating and wetting-out properties, reinforced dirt-removing power and unusual emulsifying action. It is an anhydrous, free-flowing powdered silicate containing not less than 60% Na_2O, which may also be used as an economical constituent of high pH cleaning compounds.

We'll be glad to send you our DRYMET File Folder containing complete technical information and suggested formulations.

*Reg. U. S. Pat. Off.

PROMPT SHIPMENTS FROM CONVENIENT WAREHOUSE STOCKS

Cowles Chemical Company

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companies. He joined the company in 1946. Prior to that time he was a senior research chemist at Hoffman-LaRoche where he was engaged in organic research.

• Joseph E. Conklin has been appointed sales representative for Antara Products, **General Aniline & Film Corp.** Mr. Conklin, who was formerly with Francis I. du Pont & Co. as a registered representative, will handle sales of Chat, the liquid detergent.

• D. Roy McCullagh has been named a member of the **Sterling-Winthrop Research Institute.** He will serve as director of the Institute's biochemistry laboratories.

NEW CHEMICAL SPECIALTIES

Note: This section limited to new finished specialties. New raw materials and intermediates of interest to specialties manufacturers are described in New Products and Processes department.

Fire-resistant Coating

Special coating makes gas tanks fire-resistant, bullet-sealing.

A special fire-resistant, flexible coating that can be applied by a brush to any fuel container has been developed by the B. F. Goodrich Co. for the U. S. Navy. In tests, tanks coated with the composition did not burn when subjected to flames ranging in heat from 1,500 to 2,000° F. while uncoated ones went up in flames. The tanks are also bullet-sealing.

These properties are of great value to combat aircraft, but use of the new compound in commercial aviation, for gasoline storage tanks, and for vehicle fuel tanks is also foreseen.

One-Coat House Paint

Rubber-based house paint recommended for one-coat refinishing.

The Wilbur & Williams Co., Boston, Mass., has added a rubberized one-coat house paint to its line. The combination of the rubber base with specially processed oils is said to result in a paint that is exceptionally high hiding, has excellent gloss retention, is durable and easy to apply. Supplied in white, it can be easily tinted with oil colors.

Spray Wax Products

Automobile and furniture waxes available in self-dispensing packages.

Connecticut Chemical Research Corp. has developed two new products which have been added to the "Packaged Power" line of Bostwick Laboratories, Inc., Bridgeport, Conn. (*CI, April 1949, p. 562*). They are

the Bostwick Automobile Spray Wax and the Bostwick Household Spray Wax, both of which are packaged in aerosol dispensers.

The automobile wax consists primarily of No. 1 carnauba wax with certain additives to permit uniform suspension in the propellant over a long period of time and provide ease of application (a valve is pressed by the finger); ease of polishing (simply wipe wax off with cloth); durable and high gloss; labor and time saving (a car can be waxed in five to ten minutes); and economy (one can will do 3 average-size cars).

The household wax is similar to the automobile product in type of wax, but it

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3 WIDELY USED Baker COMPOUNDS

Each one of Baker's Molybdates has a specific use, but all three have this in common—physical and chemical uniformity according to its degree of purity. The name Baker is your assurance of this dependability.

SODIUM MOLYBDATE, Technical Anhydrous

This compound is popular with the ink and color industry for producing permanent tones and pigments because it is manufactured with controlled optimum pH. Its high assay of contained Molybdenum, its low cost for contained Molybdenum, and its convenient use for batches of any size, are three important advantages.

AMMONIUM MOLYBDATE, C. P. Fine Crystal, 81–81½% MoO_3

This chemical is made to a high and very uniform standard of chemical purity to serve as a catalytic raw material. Batch after batch will be found to have the same exact degree of purity—a factor so necessary with catalytic agents. One important use is for the manufacture of Formaldehyde.

AMMONIUM MOLYBDATE, C. P. Special

Manufacturers of radio tubes, and other products where molybdenum filaments are required, appreciate the extreme purity of Baker's Ammonium Molybdate, C. P. Special. It has wide acceptance for metal reduction purposes.

Samples and prices on any one or all three Molybdates will be gladly forwarded upon request. Address your letter direct to J. T. BAKER CHEMICAL CO., *Executive Offices*, Phillipsburg, N. J.

Baker's

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL

Baker's

has been designed with spray characteristics and solutions said to be ideal for use on furniture. It is as convenient and easy to use as the other product.

Both are fair traded at the retail price of $1.59 for one 12-oz. container, or for two, $3.10.

Plastic Starch

New permanent starch being test-marketed in Chattanooga.

Glide, a durable plastic starch manufactured by Synco Products Co., Inc., Chattanooga, Tenn., is being test-marketed in that city. Sold in a 16-oz. bottle for 59¢ in grocery stores, it is being supported by newspaper, radio and point-of-sale advertising. It is said to give a linen-like finish to cotton that will withstand 20 launderings, to impart a flexible stiffness that minimizes fraying, to be mildew-proof, non-toxic, and not to yellow fabrics. A patent application for the product has been filed. National distribution is planned.

Nitrate Dope Rejuvenator

Finishing system renews deteriorated nitrate-dope films on planes.

Monsanto Chemical Co. has developed a finishing system for rejuvenation of nitrate-doped aircraft to add to its Skylac aircraft finishes. The new material not only re-plasticizes and softens original film, but will flow together major cracks and checks. It is of much interest to owners of small aircraft.

The company recommends that deteriorated hot or cold doped surfaces be mist coated with two to four coats of Skylac Rejuvenator L-6948; then given one cross coat of Skylac Clear with approximately 6 oz. of aluminum powder added per gallon; and finally receive one cross coat of Skylac Pigmented color as desired.

Resin Casting Sealer

New liquid resin for sealing porous castings developed by G-E.

General Electric Co.'s Chemical Department has developed a new liquid resin for sealing porous, light metal castings. Called G-E Permafil, the new material permits foundries to salvage castings which would otherwise be rejected because of porosity, and to permit their use on applications involving oil or vapor pressures.

A polyester-type resin, G-E Permafil converts to a tough, clear, solid, free of voids, through the action of catalysts and heat. Castings are sealed by vacuum impregnation and a subsequent short oven bake.

Photographic Film

Binder and color former combined in a single material.

The Du Pont Co. has produced a color film for the professional motion picture industry, from a new, synthetic polymer which is also a color former. The product, which takes the place of both the gelatin binder and the color former heretofore used in color films, is a basic improvement in the field. This combination in a single material results in excellent color reproduction and improved sharpness.

Resin Coating

Thermosetting resin is acid-, alkali-, and temperature-resistant at 325° F.

Carboline Co., 7603 Forsythe Blvd., St. Louis, Mo., has developed a resin, called Carbo-Flex, with resistance to acids, alkalis and solvents at temperatures as high as 325° F. and with resistance to foot traffic and material handling. The material consists of a liquid and powder which when mixed has a mortar-like consistency and is applied by trowel.

Crosby Chemicals, Inc., with two large modern plants in full production and with an abundant supply of raw materials can take care of your requirements of—

CROSBY

THE MARK OF QUALITY

STEAM DISTILLED WOOD TURPENTINE
HEAT TREATED PALE WOOD ROSINS
TERPENE HYDROCARBON SOLVENTS
HEAT TREATED FF WOOD ROSINS
STEAM DISTILLED PINE OILS
NAVAL STORES SPECIALTIES
RESINOUS CORE BINDERS
LIMED WOOD ROSINS
PALE WOOD ROSINS
BEREZ WOOD RESIN
P. E. ESTER GUM
ALPHA TERPINEOL
BETA TERPINEOL
TERPIN HYDRATE
FF WOOD ROSIN
BETA PINE OIL
ALPHA PINENE
ESTER GUMS
PAPER SIZE
GLOSS OILS
ROSIN OIL
DIPENTENE

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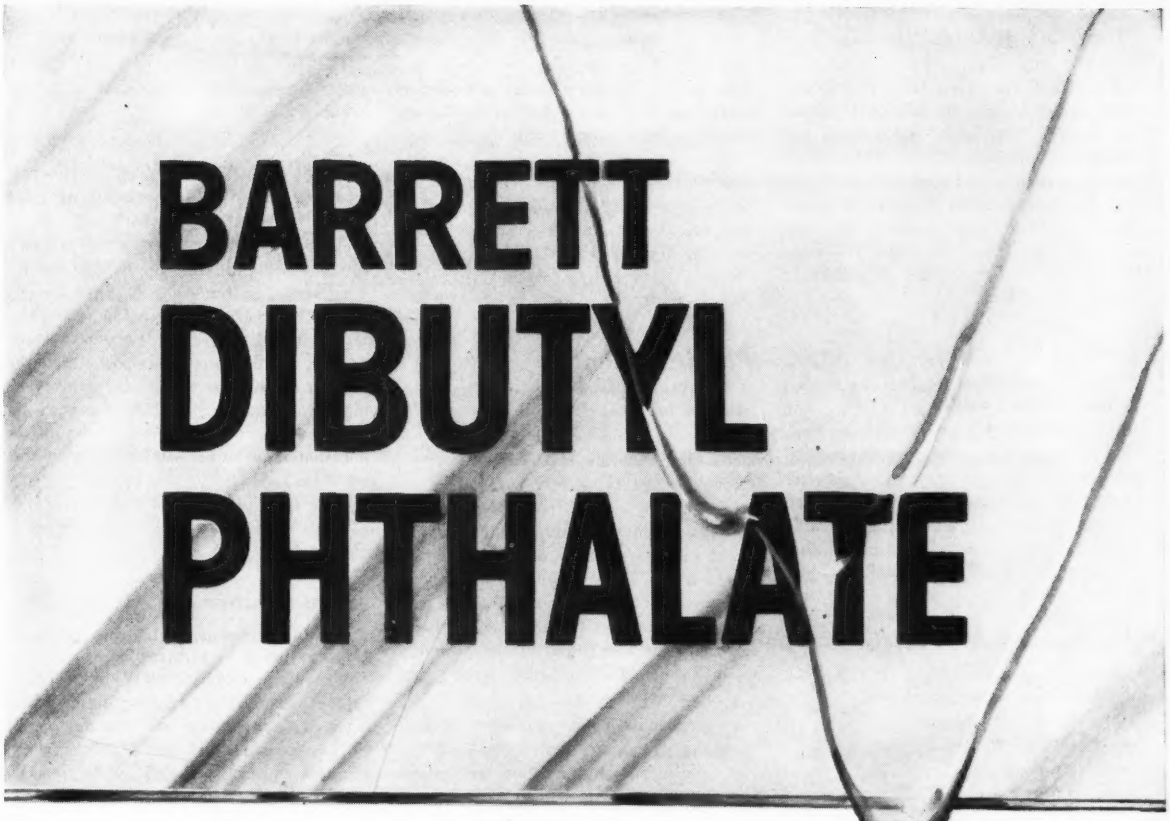
Crosby Chemicals, Inc., is the only producer of Steam Distilled Wood Naval Stores Products who at present is authorized to mark their products "U. S. Government Inspected and Certified" at source of production.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

CROSBY CHEMICALS, INC.
DE RIDDER, LOUISIANA
Plants: Picayune, Miss., and De Ridder, La.



...A SUPERIOR MODIFYING AGENT AND PLASTICIZER OF EXCELLENT COLOR AND LOW ODOR

Appearance	Oily, water-white liquid
Odor	Substantially none
Acidity (as Phthalic Acid)	0.01% by weight max.
Specific Gravity 20/20°C.	1.047-1.049
Assay (ester content)	Min. 99% by weight
Distillation @ 5mm Hg, °C.	173-177
Refractive Index @ 20°C.	1.4910
Viscosity—centipoises	
@ 5°C.	43.9
@ 25°C.	16.2
@ 50°C.	6.7
Weight per gallon	8.75 lbs.

Containers: 50-55 gal. one-way steel barrels

Barrett dibutyl phthalate is soluble in or miscible with the common organic solvents and diluents, but is practically insoluble in water. It is compatible with most lacquer resins and has a high plasticizing efficiency for nitrocellulose.

It is one of the most widely used plasticizers for nitrocellulose lacquers and cements and is extensively used with synthetic resins and rubbers. Recommended as a plasticizer to impart good low temperature properties to rubber stocks.

Its excellent color and low odor have served to promote its use in such special products as finger-nail lacquers and paper coatings.

BARRETT* CHEMICALS AVAILABLE TO THE PLASTICS INDUSTRY

Dibutyl Phthalate
"ELASTEX" DCHP Plasticizer
"ELASTEX" 10 P Plasticizer
"ELASTEX" 50 B Plasticizer
Phthalic Anhydride
Phenol
Cresols
Cresylic Acids
Toluol

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
In Canada: The Barrett Company, Ltd.,
5551 St. Hubert St., Montreal, Que.

Barrett*

*Reg. U. S. Pat. Off.

Enough of this material has been applied and subjected to service to establish its value for lining wood tanks and protecting concrete floors, although it may have many other applications.

It is a thermosetting resin which solidifies in from two to twenty hours. Its color is black. It is very hard and relatively brittle, but it does have a flexibility of from 7% to 15%.

Line of Driers

New line of driers made from 2-ethyl hexoic (octoic) acid.

Whitco Chemical Co., 291 Madison Ave., New York City, is now in commercial production of a complete new line of driers to be marketed under the name Witco Octoic Driers. The new driers are metallic soap solutions in a petroleum solvent, and they are made from 2-ethyl hexoic (octoic) acid.

Hammer-Effect Finish

Hammer-tone suitable for hiding metal surface imperfections.

The Industrial Research Division of Brooklyn Varnish Mfg. Company, Inc., Brooklyn, N. Y., has developed a new hammer-effect finish, called Tuf-On Hammer-Namel. Hammer-Namel is applied in a one coat application, to yield a smooth, lustrous hammer-tone, impervious to marring or abrasion. It is ideal for disguising imperfections of metal surfaces, and it doesn't show dust. Available in chrome and colors, as desired, Hammer-Namel bakes in 20 minutes at 300°F. Samples and technical data can be obtained from the manufacturer.

Plastic Cement

Thermoplastic resin cement has wide number of uses.

A new plastic cement, Dekadhese, is being distributed by Hayes Research Co., Cambridge, Mass. It is said to have excellent clarity which recommends it in applications involving invisibility and extreme clarity, such as the cementing of glass, acrylic and cellulose plastics. It dries fast, is cold-setting, and remains permanently flexible. Other characteristics are high resistance to oil, gasoline, vermin, mould, water and moisture vapor; and high dielectric strength.

Dekadhese has positive adhesion on such tough-to-cement surfaces as glass, rubber, metal, formica, vinyl plastics, as well as a variety of other materials. It is a thermoplastic resin, with a dry-film softening point of 230°F.

Antiseptic Floor Dressing

Floor dressing for control of dust contains bacteriostatic agent.

An antiseptic floor dressing, called Trol-Dus, is being offered to distributors by Fuld Bros., Baltimore, Md. Made for the control of dust in public buildings and the like, it is said to give a soft luster to floors as well as to control dust-borne bacteria and virus particles which may cause respiratory infections. This novel feature of the product is made possible by the incorporation of a bacteriostatic agent in the formula.

Price schedules and information on private label orders can be had from the manufacturer.

Metal Cleaner

Product improves cleaning of zinc castings prior to electroplating.

A new, improved cleaner for reverse current cleaning of zinc base die castings prior to electroplating has been developed by The Pennsylvania Salt Manufacturing Co. and will be marketed by its Special

(*Turn to page 295*)

CHEMICAL KESSCO PRODUCTS SPECIALTIES

PROPYLENE GLYCOL DIPROPIONATE

DIBUTYL TARTRATE • BUTYL STEARATE • BUTYL OLEATE
BUTYL "CELLOSOLVE"* STEARATE • METHYL "CELLOSOLVE" OLEATE
*TRADEMARK OF C & CCC

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Textile, Cosmetic, Pharmaceutical, Petroleum, Plastic and Allied Industries

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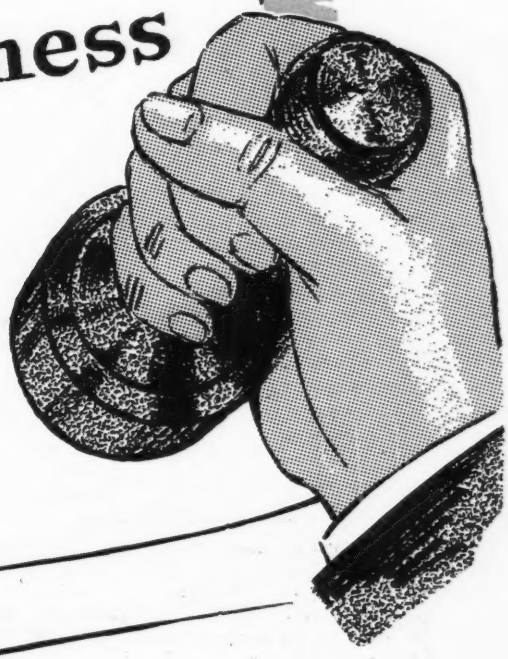
QUALITY

is our business



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● You name the special or standard grade and Hardesty will deliver it as ordered . . . every time. Fatty Acid specialization is the reason. By concentrating on doing one job well, Hardesty produces the highest quality fatty acids and their derivatives.

The latest production processes and techniques plus constant "personalized" checking of every order spells prompt, protected shipments for you. On your next fatty acid requirement try Hardesty . . . first for fatty acids!

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Stearine Pitch
Hydrogenated Fatty Acids
Animal and Vegetable Distilled Fatty Acids

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NEW PRODUCTS & PROCESSES

Propionic Acid Derivatives NP 944

β-Chloropropionic and β-mercaptopropionic acids offered by B. F. Goodrich Chemical.

B. F. Goodrich Chemical Co. is now offering β-chloropropionic acid and β-mercaptopropionic acid in experimental quantities.

β-Chloropropionic acid undergoes the usual reactions of carboxylic acids such as esterification, amide formation and salt formation in addition to the reactions possible with the active chlorine. It is available as a white crystalline water soluble solid, melting at 36-39°C.

β-Mercaptopropionic acid is available for the first time to the chemical industry. It reacts both as a carboxylic acid and as a mercaptan. With a purity of approximately 99%, it is available as a water soluble liquid distilling at 114-115.5°C @ 13 mm.

These chemicals may have valuable properties as offered and may also be used as intermediates for the synthesis of new and unusual organic chemicals.

Calcined Magnesia for Neoprene NP 945

New form of calcined magnesia for improved scorch resistance in compounding of neoprene.

Magnesia which is calcined for maximum scorch resistance in neoprene compounds is so sensitive to carbon dioxide and to moisture from the atmosphere that pulverizing, with consequent exposure of large surface areas to the air, greatly reduces its efficiency.

Calcined magnesia, therefore, is now made available by the General Magnesite & Magnesia Company of Plymouth Meeting, Pa., in lump form, just as it comes from the kilns, packaged in heat-sealed polyethylene bags for protection from moisture and carbon dioxide.

The magnesia thus reaches the user with its properties as a scorch-resisting material in neoprene undiminished.

The fact that material is in lumps instead of in powder form does not retard the rate

of cure. The mixing stresses in Banbury mixers and on rubber mills are so great that the very friable lumps are completely pulverized, and dispersion in the rubber is at least equal to that of any powdered magnesia.

Sodium Hydride NP 946

Research quantities now, commercial quantities later, of sodium hydride.

Metal Hydrides Inc. announces the availability of research quantities of sodium hydride. Since completing arrangements with Du Pont whereby they would manufacture and sell this product, construction of a new plant has been started. While not yet completed, if present engineering schedules are maintained, commercial quantities will be available early in the fall of this year. In the meantime, Metal Hydrides can make available to all interested parties sufficient material for development and research purposes.

Sodium Amide NP 947

Sodium amide available as free-flowing powder.

The Farchan Research Laboratories offers sodium amide as a free flowing powder. In this convenient form it is ready for immediate use. Sodamide should prove of great interest as a valuable condensing agent in the manufacture of pharmaceuticals, perfume intermediates, fine chemicals, and general organic synthesis. Its use is well known in such reactions as the Claisen condensation, alkylations and acylations of ketones, aminations, and ring closures.

Organics NP 948

Columbia Organic Chemicals Co. introduces several new intermediates.

Columbia Organic Chemicals Co., Inc., announces the availability in experimental quantities of the following new organic chemicals: suberic acid, M.P. 140°; pimelonitrile; suberonitrile; phenylethyl mercaptan, B.P. 98-100°/20 mm.; phenylpropyl mercaptan, B.P. 118-120°/20 mm.; 3-hexanal, B.P. 136° n_{20}/D 1.41615; 1,1,2-trichloro-2-fluoroethane, B.P. 102°; 1,2-dichloro-1-fluoroethane, B.P. 71-73°; 1,2,2,-trichloro-1,1 - difluoroethane, B.P. 70-72°; 1,1,2,2,3,3-hexachloro-1,3-difluoropropane, B.P. 192-194°; 1,1,2,2,3-pentachloro-3,3-difluoropropane, B.P. 167-169°; ethyl difluoromonochloroacetate, B. P. 97-98°; sym. heptachloropropane, B. P. 108-110°/10mm.

Anionic Detergents NP 949

Five new detergents of alkyl amide sulfonate type introduced by Antara Products.

Five new anionic foaming detergents, known as the Antarons, were added last month to the list of Antara Products, General Aniline & Film Corp.

The new anionics are alkyl amide sulfonates and are companion products to Antara's non-ionic Antarox series: the aromatic and aliphatic polyglycols.

Like the Antaroxes, the Antarons are designated by number, each having different characteristics and properties.

Antaron L-135 is a mixture of alkyl amide sulfonate and sodium chloride and comes as a light yellow powder. This product is soluble in water and electrolytic solutions, and is stable to acids, alkalis, and temperature change. It has a density of 0.54. It is used for most general cleaning operations, washing woolens and fine fabrics, washing fruits and vegetables, and dairy cleaning.

Antaron L-177 is a more concentrated form of Antaron L-135.

Antaron L-135 and Antaron L-177 are

CHEMICAL INDUSTRIES TECHNICAL DATA SERVICE

CHEMICAL INDUSTRIES, 309 W. Jackson Blvd., Chicago 6, Ill. (8-9)

Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

NP 944	NP 948	NP 952	NP 956	NP 960
NP 945	NP 949	NP 953	NP 957	NP 961
NP 946	NP 950	NP 954	NP 958	
NP 947	NP 951	NP 955	NP 959	

Name ..... (Position) .....
(Please print)

Company .....

Street .....

City ..... (Zone) ..... State .....

MARKING ITS GOLDEN ANNIVERSARY, COLUMBIA SALUTES THE GREAT INDUSTRIES IT SERVES

The past fifty years constitute an era for American industry which is without parallel in the history of the world. Industrial technical progress and physical expansion have helped to save the nation in two great wars . . . and have enabled its people to enjoy great benefits that should be a constant reminder of the value of the free enterprise system through which these advantages have been obtained.

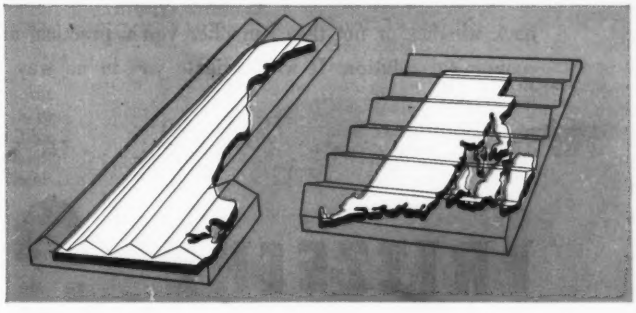
Columbia is proud of its fifty years of service to so many of the great basic industries of the nation. It looks forward to keeping pace with the new progress which these industries are now beginning. Pittsburgh Plate Glass Co., Columbia Chemical Division, Fifth at Bellefield, Pittsburgh 13, Pa.

MILLIONS OF TONS OF ALKALIES FOR ALUMINUM • CHEMICALS • DRUGS • EXPLOSIVES • FOODS • GLASS • PETROLEUM • PLASTICS • PULP AND PAPER • RAYON • RUBBER • SOAP • STEEL • TEXTILES

Since 1899, when its first plant began operations at Barberton, Ohio, Columbia has produced vast quantities of alkalies and related products which, at some stage, have entered into the production of almost every product essential to modern living.

50 Years of Service to the Nation's Basic Industries

Greenhouses for Delaware and Rhode Island! Columbia's production of Soda Ash alone, if used solely in the making of window glass, would produce enough to more than cover the total land and water areas of both Delaware and Rhode Island!



COLUMBIA CHEMICALS

CHICAGO · BOSTON · NEW YORK · CINCINNATI · MINNEAPOLIS · CHARLOTTE · ST. LOUIS · PITTSBURGH · CLEVELAND · PHILADELPHIA · SAN FRANCISCO

PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

WE'VE DONE IT FOR THE OIL INDUSTRY . . .

OF the thousands of finished products stemming from the petroleum industry, a majority have odors that are strong and not infrequently of a character inappropriate to their intended use. Properly treated, however, these odors can be pleasantly modified or effectively eliminated . . . and at a cost so small as to be negligible. Our widely used NEUTROLEUM series—one of the most economical and best all-around neutralizing compounds ever developed—was an outgrowth of experiments conducted by our laboratories for this industry.

PERHAPS WE CAN DO IT FOR YOU! . . .

Your industry may be tolerating odors no more difficult to modify than those which plagued the oil industry for many years. Like theirs, your products may retain unpleasant residual odors. Or certain of your processing operations may be producing conditions unfavorable to the health or efficiency of your plant personnel. In any case, it may be worth your while to place your problem before us . . . let our odor specialists study it and report back whether or not they can offer you a practical and economical solution. It will obligate you in no way to let us try.

FRITZSCHE Brothers, Inc.

Est. 1871

PORT AUTHORITY BUILDING, 76 NINTH AVENUE, NEW YORK 11, N. Y.

BRANCH OFFICES *and* *STOCKS. *Atlanta, Ga., *Boston, Mass., *Chicago, Ill., Cincinnati, O., Cleveland, O., Dallas, Tex., Detroit, Mich., *Los Angeles, Calif., Philadelphia, Pa., San Francisco, Calif., *St. Louis, Mo., *Toronto, Canada and *Mexico, D. F.
FACTORY: *Clifton, N. J.*

among the few synthetic detergents which, when combined with ordinary soaps, will improve their performance.

Antaron N-185 is a similar product which comes as a buff-white powder with a slightly sweet odor. This product is soluble in water, hard water and moderately soluble in electrolyte solutions. It is also stable in acid solutions, alkaline solutions, metal ions, boiling water and on storage. The greatest application for Antaron N-185 is in the prevention of curd formation of 2,4-D amine salts in hard water. It may also be used as a general detergent and in metal cleaning, as a steel pickling bath assistant, foamer and dispersant for metal salt precipitates, and in neutral or alkaline metal degreasing.

Antaron L-114 is a light yellow gel. This product may be used in most of the places that Antaron N-185 is used, except in the dispersing of 2,4-D amine salts in hard water.

Antaron R-275, a grey-white powder, may be used in metal cleaning with Antarox A-180 for non-alkaline metal degreasing. Combined with Antaron L-135, it may be used in wettable DDT powders. It is a good anti-spotting agent in film developing and is used in emulsion copolymerization of Buna S-type synthetic rubber.

Synthetic Pyrethrins NP 950

Allyl homologue of Cinerin I available for biological testing.

Montrose Chemical Co., Lister Avenue, Newark, N. J., is offering synthetic pyrethrins (allyl homologue of Cinerin I) for biological tests in 1 to 10 gram lots. The synthetic material was described in recent U. S. Department of Agriculture papers as being as effective as, and more stable than the natural product, and like it, non-toxic to higher animals.

Pigments NP 951

Burgess Pigment Co. introduces two compounding pigments.

Burgess Pigment Co. is exclusively producing two new pigments under U. S. Patent 2,307,239.

"Iceberg" Pigment, a white anhydrous pigment with 90-92 brightness, is used as a coating and filler pigment by the paper and boxboard industries, and as a white pigment by the rubber, plastic, paint, ink, ceramic, linoleum, and other industries.

Burgess Pigment No. 30, also produced exclusively under this patent, is for use in synthetic rubber and vinyl compounds.

Vinyl Stabilizer NP 952

Dibasic lead phosphite doubles vinyl plastic life.

A new stabilizer for vinyl-type plastics, called Dyphos, has been developed by National Lead Co.'s research laboratories,

7 HOOKER ACID CHLORIDES

You should know . . .

As a major producer of high quality chlorine, Hooker is able to manufacture acid chlorides of high purity and uniformity. If you are working with dyestuffs, plasticizers, pharmaceuticals, lubricants or in other processing fields where you require good quality acid chlorides, you should check into these Hooker products.

The acid chlorides Hooker can supply are listed below with brief information about their physical and chemical characteristics and their uses. More complete information is given on individual Technical Data Sheets available when requested on your business letterhead. Hooker's Technical Staff is also ready to work with you on the application of Hooker chemicals to your specific problems.

PRODUCT *Chemical Formula and Molecular Weight*	DESCRIPTION AND USES
Metanitrobenzoyl Chloride $NO_2C_6H_4COCl$;185.5	Yellow to brown liquid partially crystallized at room temperature. Last crystal point 28° to 31° C. Manufacture of dyes for fabrics and color photography; intermediate in preparation of pharmaceuticals.
Paranitrobenzoyl Chloride $NO_2C_6H_4COCl$;185.5	Yellow crystalline solid. M.P. 70° C minimum. Manufacture of novocaine, procaine hydrochloride; dyestuffs.
Acetyl Chloride CH_3COCl;78.5	Clear, colorless to pale yellow liquid. Dist. R. 2.5° incl. 51° C. To introduce acetyl group into organic compounds. Manufacture of intermediates, dyes, and pharmaceuticals.
Benzoyl Chloride C_6H_5COCl;140.5	Clear, colorless liquid. Boiling point 198° C. As a highly reactive acid chloride, it may be used to introduce the benzoyl group into organic compounds, especially through Friedel-Crafts reactions. It is used in the manufacture of synthetic perfumes, pharmaceuticals, dyes and resins.
Phosgene (Carbonyl Chloride) $COCl_2$;98.9	Liquified gas. F.P. —126°C., B.P. 8.2°C. Manufacture alkyl and aryl chlorocarbonates and dialkylcarbonates; dye intermediates; metal chlorides and anhydrides; pharmaceuticals; perfumes.
Sulfuryl Chloride SO_2Cl_2;135.0	Light yellow liquid. B.R. 2° incl. 69.5°C. Reacts with organic acids to form other chlorides and anhydrides. Chlorinating agent for chlorophenol and other chlorination reactions in organic synthesis.
Thionyl Chloride $SOCl_2$;119.0	Clear, pale yellow to red liquid. Refined Grade, 97.5% min. $SOCl_2$; Technical Grade, 93+%. Manufacture of organic acid chlorides and anhydrides, alkyl chlorides from corresponding alcohols. It may be used to introduce sulfur alone or in combination with oxygen.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

3 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.

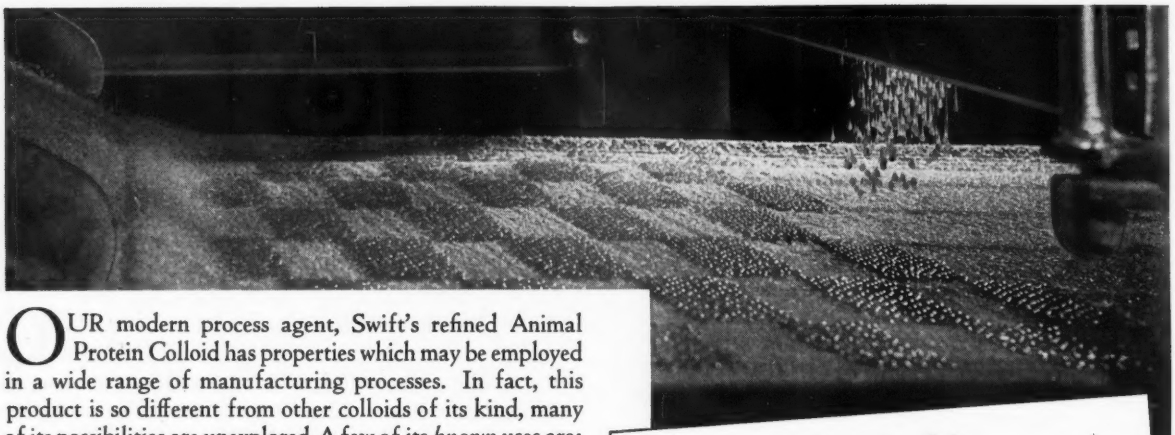
NEW YORK, N. Y. • WILMINGTON, CALIF. • TACOMA, WASH.

9-911

SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM TETRASULFIDE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

You tell us! *What uses can be made of a process agent as clean as...*

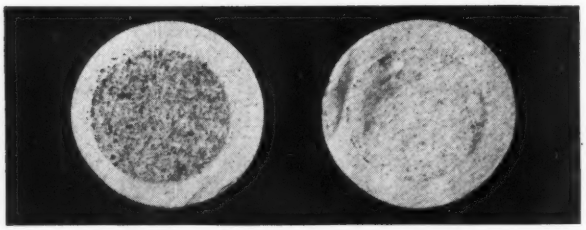
Swift's Animal Protein Colloid*?



OUR modern process agent, Swift's refined Animal Protein Colloid has properties which may be employed in a wide range of manufacturing processes. In fact, this product is so different from other colloids of its kind, many of its possibilities are unexplored. A few of its *known* uses are:

1. An emulsifier
2. A flotation agent
3. A gel structure
4. A settling agent
5. A protective coating
6. A sizing agent
7. A carrier of pigments
8. An impregnating agent
9. A base for pigments
10. An oilproofing agent
11. A flocculating agent
12. A clarifying agent
13. A filtering agent
14. A stiffening agent
15. A mordant
16. An adhesive

...but there may be many *others* of equal value!



Here a filter test indicates the relative cleanliness of this new process agent. Left: Ordinary commercial grade bone glue. Right: Swift's Animal Protein Colloid.

Try it for yourself. We invite you to test the possibilities of Swift's Animal Protein Colloid. It may meet your present requirements or help you to develop new products or more efficient processes.

For further information about Swift's Animal Protein Colloid write: →

*Commercially high quality bone glue

What is this modern process agent?

Swift's Animal Protein Colloid is made by an exclusive Swift process. This process makes possible the production of high quality protein colloid of unusual uniformity in particle size and composition.

In a spotless modern plant, protein liquor falls on a bed of dry finished product (see photograph) which adheres evenly to the droplets. By continuous schedule, under precise control every second, these droplets are dried, milled and screened.

During this almost automatic operation, the product has no contact with materials which could contaminate it with foreign substances.

As a result, Swift's Animal Protein Colloid is a clean, finely ground powder (light amber in color) which goes into solution rapidly.

Swift & Company

Adhesive Products Department

4109 Packers Avenue

Chicago 9, Illinois

and is now on the market. Tests in the laboratory and under outdoor exposure show that the useful life of Dyphos-stabilized plastic compounds is at least twice that of similar compounds stabilized by other means.

The dibasic lead salt of phosphorous acid, it is an anti-oxidant stabilizer and has unusually high heat and light stability coupled with excellent electrical properties. Flexibility, color retention, and other desirable characteristics of plastic compounds containing it are maintained over long periods.

Unlike most stabilizers of its type, Dyphos does not change color in use and its breakdown products as well as Dyphos itself are insoluble in water or organic solvents, which is very important in all of its many applications.

Vinyl Plasticizer NP 953

Monomeric plasticizer, di-iso-octyl adipate, is offered commercially by Rohm & Haas.

Commercial availability of Monoplex DOA (di-iso-octyl adipate) a monomeric plasticizer of unusual efficiency, has been announced by the Resinous Products Division of Rohm & Haas Co.

Produced as a distilled ester of high purity and excellent color, it is said to function well as a plasticizer for light and heavy weight vinyl film, supported and unsupported, for organosol and plastisol compounds, for molded and extruded vinyl stocks and as a modifier for vinyl emulsions.

According to the manufacturer, it imparts outstanding low-temperature flexibility (Kemp bend-brittle temperature, —63° C.), hand and drape, and produces films of good color, clarity, stability to ultraviolet light and resistance to water extraction. The plasticizer is also an efficient modifier for blending with resinous plasticizers of the Paraplex family, where improved flexibility and softness at low temperatures are desired.

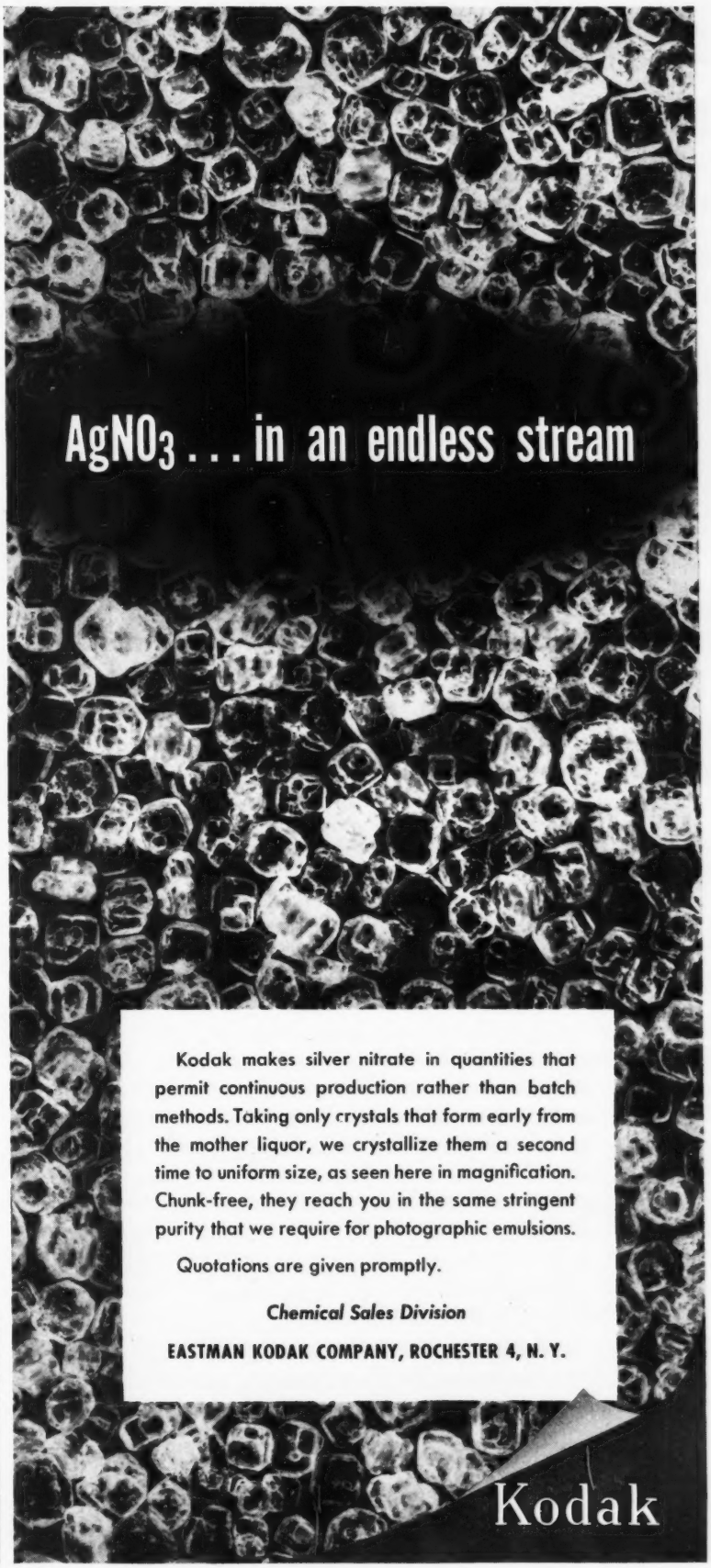
Flame-Spraying Polythene NP 954

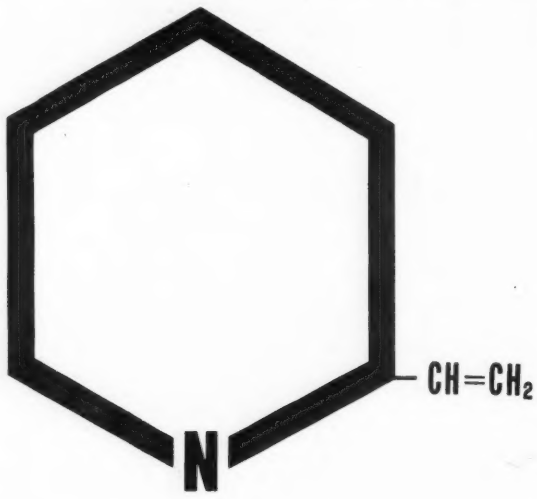
Process developed by Du Pont permits spray coating of metal surfaces with polyethylene.

A successful method for the flame-spraying of polythene on metal surfaces has been developed by the Engineering Research Laboratory of the Du Pont Co. It is considered a practical system which should find application in industry.

Polythene is unusually inert and thus is highly resistant to corrosion. Because of this characteristic, the material is particularly attractive as coatings for metal surfaces, such as tanks and drums, where corrosion is a factor. However, polythene has been difficult to apply by conventional methods because of its relative insolubility.

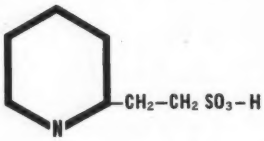
The problem in working out a satisfac-

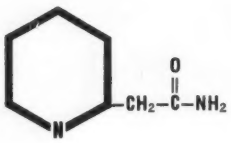

AgNO3 . . . in an endless stream
Kodak makes silver nitrate in quantities that permit continuous production rather than batch methods. Taking only crystals that form early from the mother liquor, we crystallize them a second time to uniform size, as seen here in magnification. Chunk-free, they reach you in the same stringent purity that we require for photographic emulsions.
Quotations are given promptly.
Chemical Sales Division
EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.
Kodak

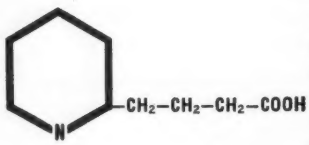


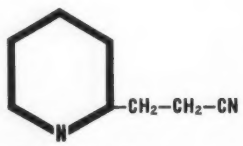
2-Vinylpyridine

a versatile organic chemical









● 2-Vinylpyridine, one of the more important coal tar products developed by Reilly, is a highly versatile organic chemical. Not only is it capable of polymerizing to form a series of unusual polymers, but it is also capable of undergoing a number of interesting reactions.

Illustrated are only a few of the many pyridine compounds that may be synthesized from 2-Vinylpyridine. The chemical activity of this material commends it to all research and production departments interested in either the preparation of polymers or the synthesis of organic chemicals.

Among the uses to which 2-Vinylpyridine has already been put have been the production of plastics and synthetic elastomers. There are also many interesting possibilities in the manufacture of pharmaceuticals, insecticides and fungicides. Manufacturers in any of these fields will find 2-Vinylpyridine well worth their investigation.

Your inquiries on 2-Vinylpyridine, or any other coal tar chemical, are invited, and will have prompt attention.

REILLY TAR & CHEMICAL CORPORATION

Merchants Bank Bldg., Indianapolis 4, Ind.

500 Fifth Avenue, New York 18 • 2513 S. Damen Avenue, Chicago 8

Reilly Coal Tar Chemicals For Industry

tory method of application was to melt the polythene particles and hold them at as high a temperature as possible without overheating them. Early work resulted in markedly degraded coatings and poor adhesion.

The satisfactory method now developed was accomplished by devising a spray gun in which the flame is obtained by mixing the fuel gas and the air needed for combustion beyond the torch nozzle, rather than by premixing them. Flames 8 to 12 inches long are used and the gun is held so that the surface to be covered is about 2 inches from the tip of the flame.

The surface must be pre-heated to 400 to 500 degrees F. and small quantities of finely powdered graphite or carbon black promote adhesion.

By this method, approximately 16 square feet per hour can be covered.

Tests indicate that adhesion is good and that the temperatures used do not degrade the polythene. Exposure tests of 300 days' duration with sulfuric, hydrochloric, and other acids have shown no deterioration in coating properties or base metal attack.

Phenolic Resins NP 955

High-speed, high-gloss phenolics offered by Rogers Corp.

A series of new medium-high impact thermosetting phenolic materials which can be molded on high speed, multicavity molds is announced by Rogers Corp.

Named Luron, the new materials have an unusually low bulk factor, a fast rate of cure, and emerge from the mold with a high gloss finish. Clean and dustless, the materials are of uniform particle size and are easily poured or automatically preformed. They can be compression, transfer or plunger molded. The recommended molding pressure range is 4000-6000 p.s.i.

Two grades of Luron are already in commercial use—RX-416 and RX-418. Both of these products are made in black only. RX-418 differs from its companion material in that a stronger cellulose fiber is used to provide greater impact strength.

Coating Resins NP 956

Bakelite introduces two oil-modified styrene copolymer solutions.

Commercial availability of new resins promising wide usefulness in the manufacture of surface coatings is announced by Bakelite Corp. The resins are oil-modified styrene copolymer solutions and are designated as Bakelite "C-10" Resins. Two types are currently available: BJS-501 and BJS-502.

BJS-501 is particularly recommended for interior architectural finishes, such as trim and wall surfaces in homes, offices, and other buildings. Air-dry enamels of exceptionally high gloss and "build" are produced. They may be applied easily by brushing and are superior to conventional enamels in resistance to fogging in in-

Announcing

2 new additions to the

Good-rite

REG. U. S. PAT. OFF.

CHEMICALS

line

β-Chloropropionic acid

$ClCH_2CH_2COOH$

β-Mercaptopropionic acid

$HSCH_2CH_2COOH$

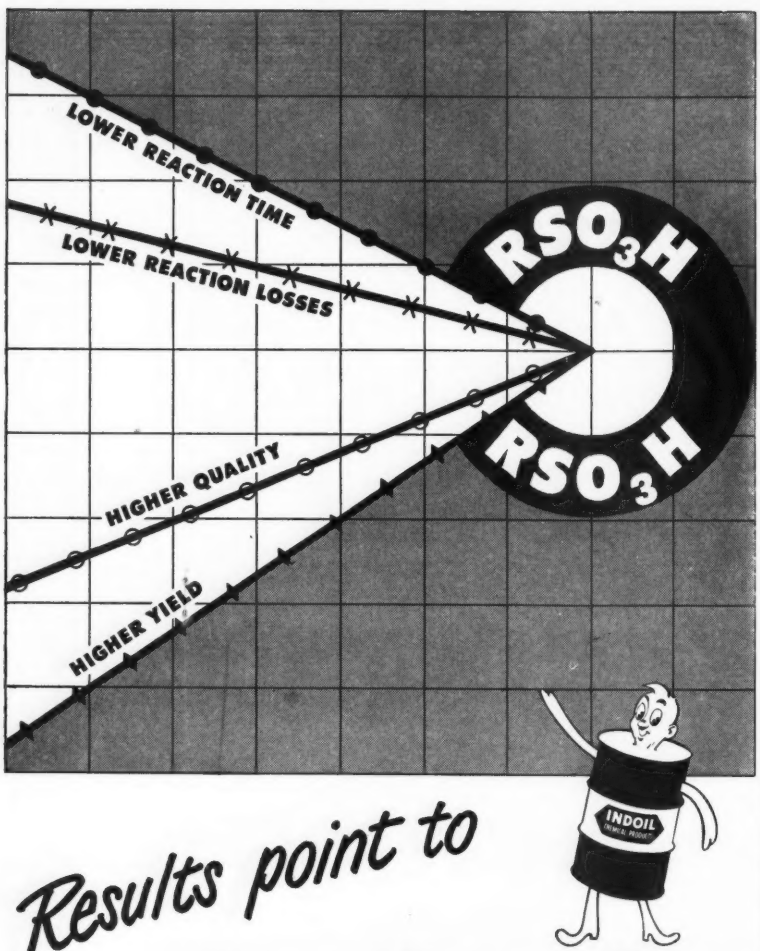
YOU are invited to look into the possibilities of these new Good-rite compounds, as acids or as intermediates to form esters, amids or salts.

Technical data and experimental samples of these organic acids are available upon request. Commercial quantities can be furnished.

For further information, please write Dept. CC-8, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers



Results point to

Mixed Alkanesulfonic Acid as a catalyst for . . .

- Esterification
- Acylation
- Condensation
- Dehydration
- Alkylation
- Polymerization

Send for Bulletin 11

INDOIL® CHEMICAL PRODUCTS

INDOIL CHEMICAL COMPANY
910 South Michigan Avenue • Chicago 80, Illinois

terior exposure. The resin is pale in color, promoting wide color possibilities, and, in addition, has good color retention, good pigment suspension and stability even with reactive pigments. Mineral spirits can be used as the sole solvent.

Enamel finishes that air-dry as fast as lacquers can be made from Bakelite "C-10" Resin BJS-502. They are already being used for toys and farm implements where it is an advantage to be able to handle such items eight to ten minutes after spray application.

Baking-type enamels based on BJS-502 offer great usefulness in meeting short baking cycles. BJS-502 also features good stability, suspension of pigments and color retention.

Adenosine-5-Phosphoric Acid NP 957

Coenzyme constituent made available for investigation and clinical use.

Adenosine-5-phosphoric acid (AMP), the adenine nucleotide usually called muscle adenylic acid, is now available from Schwarz Laboratories, Inc. Made by a process that does not require the use of animal tissues, this basic constituent of coenzymes is offered in virtually unlimited quantities. AMP is an important biochemical substrate. It has been used clinically in the treatment of cardiac affections, some types of rheumatic conditions, and malnutrition.

Styrene-Containing Neoprene NP 958

Neoprene-styrene interpolymer resists crystallization at low temperature.

A new type of neoprene synthetic rubber which shows a marked improvement in resistance to crystallization at low temperatures has been developed by E. I. du Pont de Nemours and Co.

Like natural rubber, neoprene tends to crystallize at moderately low temperatures. Improved resilience in neoprene compositions at low temperatures can be achieved by the addition of small amounts of various compounding ingredients capable of physically interfering with the process of crystallization. Certain polymerized hydrocarbons, derived from either petroleum or coal tar, were found to be the most effective agents of this type.

Result of this research was a product designated as Neoprene Type RT, which has all the virtues of general-purpose Neoprene Type GN, yet displays a high degree of flexibility at low temperatures.

Whereas general-purpose neoprene is made by the polymerization of chlorobutadiene, this new type of neoprene is an interpolymer of chlorobutadiene and styrene. Styrene, of which only a small quantity is used, is believed to inhibit crystallization by breaking up or preventing the orderly arrangement of the elas-

A page from the Stauffer Catalog

NUMBER NINE IN A SERIES

CHLORINE
(LIQUID)

Other Names . . . . None.

Formula . . . . . Cl_2.

Properties . . . . . Clear amber liquid under pressure of approx. 82 lbs./sq. inch gauge at room temperature (68° F.). Weight per cubic foot of liquid at room temperature is 88 pounds. One volume of liquid gives approx. 460 volumes of gas at room temperature and atmospheric pressure. The gas is about two and one-half times as heavy as air.

Dry Chlorine Liquid or gas is not corrosive to most metals. Moisture makes it extremely corrosive. The gas has a pungent suffocating odor, *and if breathed in high concentration may cause serious injury.* It is only slightly soluble in water; approx. 0.75% at 68° F. The dry gas is a non-conductor of electricity.

Chlorine is very active chemically. It reacts vigorously with most of the common metals and also with almost all of the non-metals. It is a powerful oxidizing agent, and displaces less active non-metals from their compounds.

Boiling Point	—34.5° C. (—30.1° F.)
Freezing Point	—102° C. (—152° F.)
Specific Gravity of Gas (@ 0° C.)	2.486 (Air = 1)
Specific Heat of Gas (@ 15° C.)	Cv = 0.085 g. cal./g.
Specific Heat of Gas (@ 15° C.)	Cp = 0.115 g. cal./g.
Specific Heat of Liquid (—80° to 30° C.)	0.226 g. cal./g.
Specific Gravity of Liquid (@ 15° C.)	1.423 g. cal./g.

Grades . . . . . Commercial.

Analysis (Typical) . Chlorine, not less than 99.7%
Residue, average 0.0075%

Principal Uses . . . Chlorine as a chlorinating agent, is used in the manufacture of many outstanding useful chemicals, drugs and insecticides. It has long served the pulp, paper and textile industries as a bleaching agent, or in the manufacture of bleaching powders. The purification of water for drinking purposes represents large consumption. The chlorides of aluminum, antimony, boron, carbon, silicon, sulphur, tin, and phosphorus are intermediates, reagents or catalysts leading to many of our present day plastics, synthetic rubbers, medicines, insecticides, synthetic fabrics, aviation fuels and lubricants—joining chlorinated organic compounds in the advance of many of the arts that bring us better material living.

Packing . . . . . Tank Cars—Single units.
16 and 30 tons (from Niagara Falls, N. Y.)
16, 30 and 55 tons (from Henderson, Nevada)

Shipping Regulations Green Label (non-flammable gas)

Stocks . . . . . Niagara Falls, N. Y. (Factory)
Henderson, Nevada (Factory)

STAUFFER PRODUCTS

BHC (Benzene Hexachloride)
Borax
Boric Acid
Carbon Bisulphide
Carbon Tetrachloride
Caustic Soda
Chlordane
Chlorine
Citric Acid
DDT (Dichloro Diphenyl Trichloroethane)
Silicon Tetrachloride
Sodium Hydrosulphide
Sulphur (Specially processed for all industrial uses)
Sulphuric Acid
Tartaric Acid
Textile Stripper
Titanium Trichloride
Toxaphene (Chlorinated Camphene)
2, 4-D (Acid, Isopropyl Ester, Amine Salts)

Stauffer CHEMICALS SINCE 1885

STAUFFER CHEMICAL CO.

420 Lexington Avenue, New York 17, N.Y. · 221 North LaSalle Street, Chicago 1, Illinois
555 South Flower Street, Los Angeles 13, Cal. · 636 California Street, San Francisco 8, Cal.
424 Ohio Bldg., Akron 8, O. · Apopka, Fla. · N. Portland, Ore. · Houston 2, Tex. · Weslaco, Tex.

SODIUM AMIDE

(Free Flowing Powder)

CHECK THESE FEATURES

√ No removal of suspended oils or neutral solvents—ready for immediate use.

√ Light gray free flowing powder.

√ Improved yields in many reactions as compared with other amides.

√ Cheaper mole for mole than any other amide now available.

√ Uses:
- (a) Claisen Condensations
- (b) Alkylations
- (c) Acylations
- (d) Aminations
- (e) Ring closures, etc.

In this convenient form sodamide should prove of considerable interest in the manufacture of pharmaceuticals, perfume intermediates, fine chemicals, and general organic synthesis.

Available in Commercial Quantities

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FURFURAL Will Help You

QO FURAN CHEMICALS

$C_4H_3O \cdot CHO$

The lowest priced pure aldehyde available

DESCRIPTION

An amber colored, mobile liquid with a pungent almond-like odor.

TYPICAL ANALYSIS

Specific Gravity (20/20°C).....1.161
Boiling Point, °C, (Todd Still), 744mm. 160 (98%)

OTHER PROPERTIES

Freezing Point, °C.....—36.5
Flash Point (open cup) °C.....56.8
Refractive Index (n 25°/D).....1.5230
Surface Tension at 20°C (dynes/cm) .....49.
Viscosity (Centipoises)
38°C 1.35
54°C 1.09

In addition to properties it possesses in common with other aldehydes, furfural exhibits a chemical behavior peculiar to the unsaturated furan nucleus. As a consequence it is commanding increasing interest as a chemical intermediate.

Its versatility, its ready availability, its high purity, and its low price are reasons why you should evaluate furfural in processes and products involving its use as a *selective solvent, resin ingredient, general solvent, wetting agent* and *chemical intermediate.*

Write for Bulletin 201. A few words as to the nature of your interest will enable us to select for you other pertinent literature. Address request to nearest office listed below.

The Quaker Oats Company CHEMICALS DEPT.

1920U BOARD OF TRADE BLDG.
141 W. JACKSON BLVD., CHICAGO 4, ILL.
NEW YORK, 1232U WHITEHALL BLDG., N.Y. 4, N.Y.

In San Francisco, The Griffin Chemical Company • In the United Kingdom, Imperial Chemical Industries Ltd., Billingham, England • In Australia, Swift & Company, Pty. Ltd., Sydney • In Europe, Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A. 42, Rue Pasquier, Paris 8E, France

tomer molecules necessary for the formation of crystals.

It is anticipated that this new elastomer will extend the use of neoprene-type compositions to products where, in the past, crystallization effects have been a serious drawback.

o-Dichlorobenzene Emulsifier NP 959

New formulation emulsifies o-dichlorobenzene for garbage treatment.

Emulsifier S-1072 is an amber-colored, viscous liquid which does not contain sulfonates. It is readily and clearly soluble in *o*-dichlorobenzene in the cold and is therefore of interest for the manufacture of *o*-dichlorobenzene emulsion concentrates. The concentrate emulsifies rapidly, with little agitation, in water over a wide range of concentrations.

It has proved particularly effective in concentrates used to control the bacterial growth and putrefaction odors in garbage dumps in large cities. A concentrate is made using 25-30% Emulsifier S-1072 and 70-75% *o*-dichlorobenzene, both by volume. One part of the concentrate emulsified in 50-100 parts water makes a satisfactory stable emulsion suitable for spraying.

Emulsifier S-1072 is available in commercial quantities and is quoted at 25¢ per pound in drums by Glyco Products Co., Inc., f.o.b. Natrium (New Martinsville), W. Va. Experimental samples are available.

Anion-Exchange Resin NP 960

Highly basic anion exchanger now in full plant production.

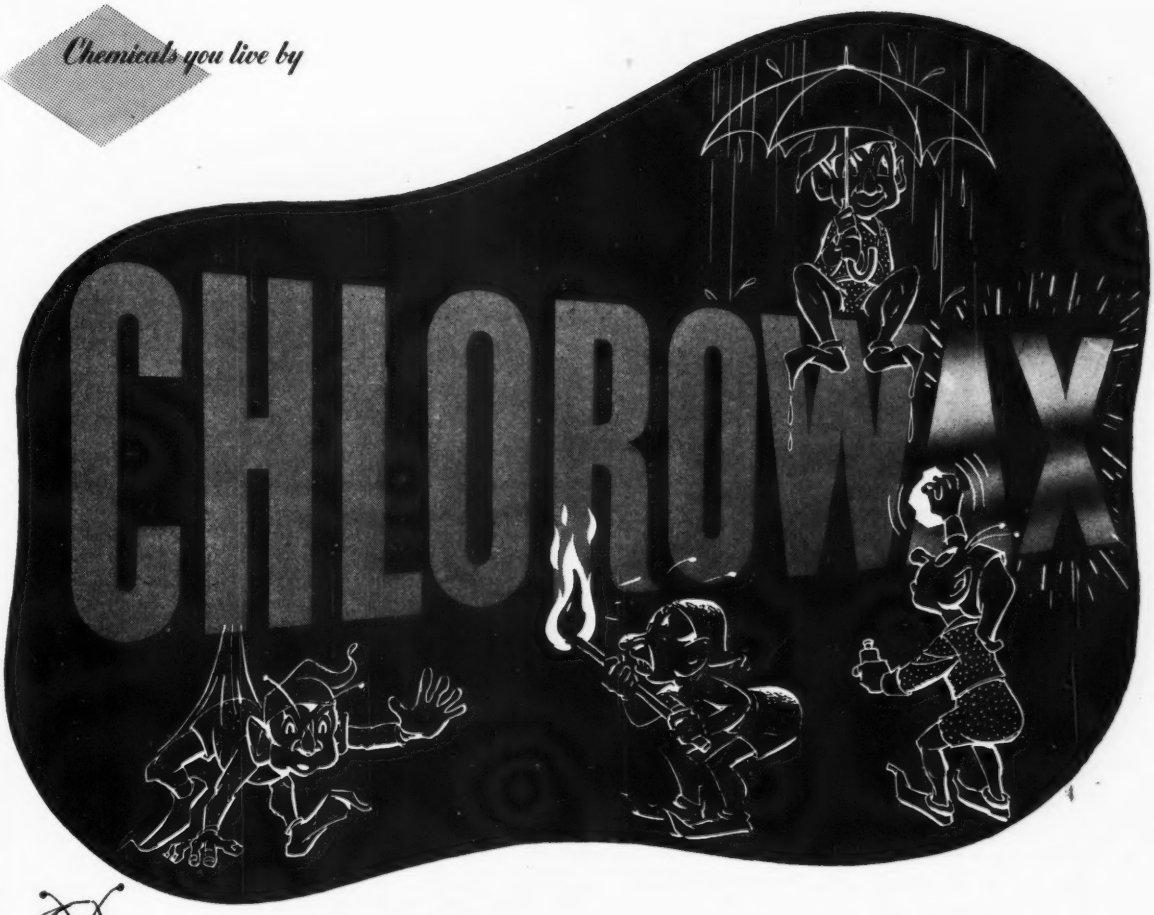
Full plant-scale production of Amberlite IRA-400, a new, strongly basic anion exchanger, has been undertaken by the Resinous Products Division of Rohm & Haas Co.

This is said to be the first resin adsorbent which can be utilized to convert neutral salts to the corresponding free bases of the metallic ions. One of its important contributions is the direct removal of silica from feed water for high-pressure boilers. IRA-400 will adsorb negatively charged ions from acid, neutral and even mildly alkaline solutions in a pH range from 1 to 10.

This exchanger behaves as solid caustic with only its hydroxyl ions in solution. Its reaction as a strongly dissociated base largely explains its high exchange rate. This rapid rate of exchange is a very desirable feature where batchwise techniques are practicable.

Thus it offers new opportunities for ion exchange methods in specialty applications apart from water conditioning. For example, it adsorbs all amino acids with isoelectric points below pH 10. And in deashing operations, it is capable of re-

Chemicals you live by



...IMPROVES
FLAME RESISTANCE
ADHESION • GLOSS
WATER RESISTANCE
CHEMICAL RESISTANCE

CHLOROWAX 70 is a chlorinated paraffin containing 70% chlorine by weight. It is a powdered solid—definitely resinous—not a wax. It is chemically inert, odorless, non-toxic, nonflammable, insoluble in water, yet soluble in a wide variety of solvents.

Color (powder)	cream
Melting point (ball & ring)	95-110° C
Specific Gravity—Solid	1.62-1.70
Molecular weight	approx. 1060
Particle size	100% thru 50 mesh 90% thru 100 mesh
Refractive index	1.5347

In one new field after another CHLOROWAX* 70 is making good products better. Its special properties, and wide compatibility have already given it an established reputation with manufacturers of such materials as paints, textile coatings, printing inks, caulking compounds, paper coatings, adhesives, and floor coverings.

CHLOROWAX 70 may help answer product problems in your field. Your nearest DIAMOND Sales Office can give you additional information and DIAMOND's Technical Service Staff is ready to help in working with you in the application of this versatile product.

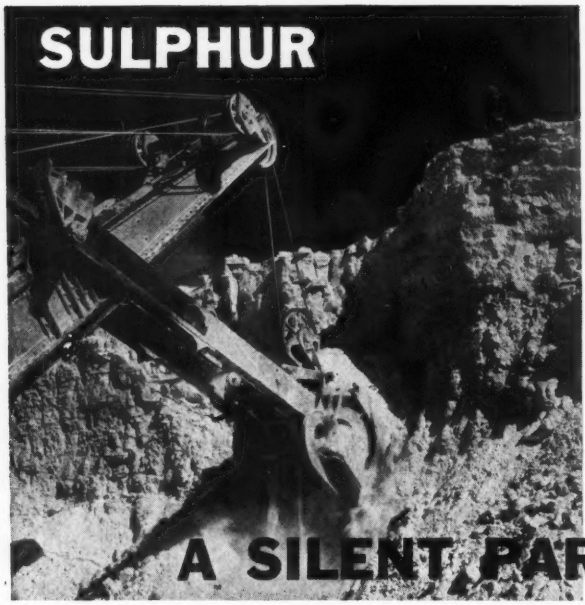
*®

DIAMOND SALES OFFICES: Boston, New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Wichita, Oklahoma City and Houston. Also representatives in other principal cities.

DIAMOND CHLOROWAX 70 AND CHLOROWAX 40

DIAMOND ALKALI COMPANY • CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS



Crude Sulphur, blasted from a storage block of Freeport Sulphur Company at Port Sulphur, Louisiana, is ready for shipment.

AMERICAN Industry has a valued "silent partner" in Sulphur, which lends its unique chemical properties to a multitude of industrial processes. For instance, Sulphur is used to help make pulp and paper, rubber, steel, rayon, fertilizer and other necessities—yet seldom appears in the finished product.

FREEPORT SULPHUR COMPANY

OFFICES: 122 East 42nd Street, New York 17, N. Y.
MINES: Port Sulphur, Louisiana • Freeport, Texas

SULPHUR SERVES INDUSTRY

ZIRCONIUM PRODUCTS

Now a basic integrated producer of Zirconium products, Berk has available in production quantities from stock:

Zirconium Sulphate — Zirconium Nitrate
Zirconium Carbonate — Zirconium Stearate
Zirconyl Acetate — Sodium Zirconium Sulphate
Zircon Sand Granular

Write for full information and samples. We are prepared to consider inquiries for any compound containing Zirconium.

MILLMASTER CHEMICAL CORP.

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PLANT: WOOD-RIDGE, NEW JERSEY

moving the anionic impurities first—a reversal of the usual deionization procedure. This technique permits safe treatment of solutions which would be adversely affected by exposure to low pH.

And, according to the manufacturer, the resin can actually be mixed intimately with a strong cation exchanger to prepare an adsorbent bed that will completely deionize solutions in one column and in one step.

Gasoline Improvement NP 961

New refining method for improving straightrun gasoline uses platinum.

A new oil refining process developed by Universal Oil Products Co. will produce high-octane motor fuel from natural gasoline at a lower cost than previously possible. Using platinum as a catalyst the process has been named "Platforming." It combines the features of large octane-number gain, low volumetric loss and moderate plant and operating costs. The platinum merely induces the reaction but is not exhausted in use.

Calcium Chloride Dries Seed

Seed can be preserved by a simple drying process using calcium chloride.

A new approach to the problem of farm drying of seed which uses chemicals instead of the conventional heat methods has been developed by engineers of the U. S. Department of Agriculture. The method appears suitable for use by the small grower. It avoids the fire hazard which exists with heated air drying and also avoids the danger of reducing germination by overheating of the seed during drying.

The Department reports laboratory experiments followed by farm tests in the drying of lupine seed with air dehydrated by passing it over calcium chloride. The chemical sells in the range of 3 cents a pound, and it took about 3 pounds to reduce the moisture content of 100 pounds of lupine seed from 17.3 to 13 per cent.

The seed is dried in a tight bin with a screened bottom through which dried air is fanned. The moistened air from the top of the bin is then recirculated to the bottom of the dryer. In the dryer unit it passes first over brine from the calcium chloride, then over the flakes of the chemical and then back to the bin again.

Wholesale handlers of seed can afford more elaborate and closely regulated equipment for drying seeds with heated air. This new method is simple and safe, and with the exception of the fan can be built by any man reasonably handy with tools, says the Department. It is likely to be used most in the Southeast where the humidity of unheated air is usually too great to make it practical to dry seed satisfactorily.

NOTES FROM THE ... NUCHAR

purification notebook

Dry Cleaners Solvent

Solvents used to remove grease, stains, and dirt from soiled clothing, carpets and other fabrics must be frequently purified. The usual methods include activated carbon, distillation, filtration, saponification with caustic; and these are frequently used in various combinations. A common practice has been to remove the oils and greases by saponification and the color, odor and other impurities by the use of Nuchar Activated Carbon. A more recent practice is to depend entirely upon the use of an adsorbent such as Nuchar Activated Carbon in a filter unit, supplemented by an occasional saponification or distillation.

Write to our nearest office and arrange to have our Nuchar Technical Service Department study your purification problems.

industrial CHEMICAL SALES

division west virginia pulp paper company

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INDUSOIL DISTILLED TALL OIL ● TALLENE TALL OIL PITCH ● TALLEX ABIETIC ACID
SULFATE WOOD TURPENTINE ● ALPHA PINENE ● BETA PINENE ● POLYCEL CELLULOSE FIBERS
INDULIN (LIGNIN)

NEW EQUIPMENT

Conveyor Belt QB 830

A new conveyor belt with a corrugated surface will raise cartons or bags up inclines of 30 to 40 degrees.

The new belt, made by Russell Mfg. Co., called Ruff-Ridge, consists of a solid woven carcass, thoroughly impregnated with a neoprene solvent cement for moisture resistance. This carcass is then coated on the upper side with a layer of a neoprene-natural rubber blend. Cured against a special mold, the top surface of the belt is corrugated, approximately 3/32" deep on 5/16" centers.

Made in 250 foot rolls, the belt is available in several thicknesses and in standard widths up to 24 inches.

Plate Filter QB 831

New filter permits quick cleaning of plates without removal from the filter.

A new horizontal plate filter of the Sparkler Manufacturing Co., is intended for use where a large volume of filtrate requires frequent cleaning of filter plates during the production run.

A convenient side panel opens to expose all plates and a specially designed horizontal plate with a flush top surface permits filter cake to be washed off quickly and completely. This plate is arranged that any type of cloth or synthetic filter media may be used. For "in-production" cleaning, the outlet valve is closed and the plates are flushed down with a hose spray in one or two minutes.

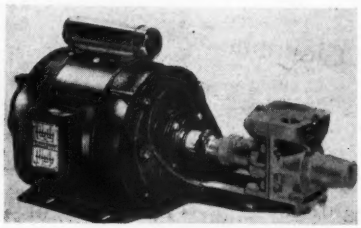
At the end of the filtration cycle, all plates can be removed at one time through the top of the filter to simplify insertion of fresh filter paper or cloth.

The filter is available in a wide range of materials and linings to handle all types of liquids, and with capacities ranging from 60 to 60,000 gph.

Gearless Pump QB 832

Eco Engineering Co. is producing a new close-coupled electric motor-driven gearless pump.

The new pump is designed to simplify installation for every direct driven pump use. It is made with ¼", ⅜", ½" and ¾" ports and give excellent suction lift



from simple circulation work up to heavy duty against 150 psi. The motors are capacitor start, induction run in single phase models. Three phase motors are also available. The entire unit is resilient mounted and has an automatic thermal overload relay.

They are supplied in ¼, ⅓ and ½ horsepower models. The compact pump unit is made by means of a pump supporting bracket attached to the shaft and bell housing of the motor. The motor and pump shafts are in perfect alignment and are nected through a flexible coupling.

Motor Operator for Gate Valves QB 833

New fluid motor operator can be adapted to valves in stock or in service.

Crane Co. has produced a simplified fluid-motor operator for gate valves. This new design can be adapted to standard valves in stock or to valves already installed. Previously, this has been a virtual impossibility, for motor-operated valves have customarily been made up on special order. The device can be operated by water, oil or compressed air or gases.

The motor unit, comprising the motor, gear box and yoke, is bolted to the valve bonnet; and the motor operates the valve stem through the gear box. The motor rerives its power from five flexible diaphragms, mounted radially about an eccentric on the drive shaft. The operating fluid is admitted in rotational sequence to the five diaphragms. These actuate pistons to transmit the thrust to the eccentric through a roller bearing mounted on the shaft. By a suitable control, the operating fluid can be admitted through either of two entrance ports, controlling the direction of operation of the motor for opening and closing the valve.

When the valve gate reaches the end of its travel in either direction, the motor merely stalls, still under pressure, and shut-off devices are unnecessary.

The valves can be operated by a wide range of liquids or gases at pressures from 40 to 300 psi. The operating mechanism delivers a high starting torque and is adjusted to deliver a greater torque for unseating the valve than for seating it. Valves equipped with the new fluid-motor operator are available in most types of Crane iron-body gate valves in sizes 4-inch through 30-inch. A handwheel is furnished for manual operation in the event of pressure failure.

Control Valve QB 834

Positioning of two body parts of new control valve permits formation of angle or straight-through type.

In the new Domotor control valve the Annin Co. claims a radical improvement in control valve body design. The valve body is comprised of two simple castings which are bolted together with the seat ring serving as a bridge or separation unit. Clean, smooth flow passages without pockets or shoulders to accumulate solids contributes to increased flow capacity. The two body parts may be rotated about the seat ring in assembly to form a right hand angle, left hand angle or a straight through pattern. The addition of a simple straight adapter makes a conventional angle pattern valve body.

This single seated valve embodies a threadless assembly.

To power this new valve a new actuating unit was developed which is of the piston type and provides operating power from 5 to 10 times that available with the conventional spring and diaphragm assembly.

An integral valve positioner unit is incorporated in the piston actuated assembly, completely housed within the

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QB831	QB836	QB841	QB846	LE146
QB832	QB837	QB842	QB847	LE147
QB833	QB838	QB843	QB848	LE148
QB834	QB839	QB844	QB849	LE149
			LE144	LE150

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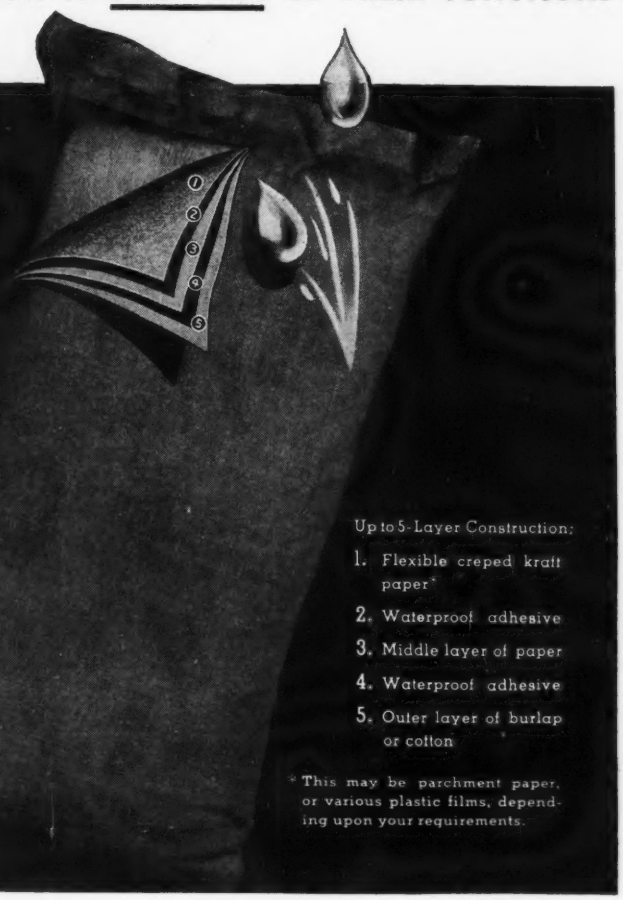

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from plan to plant

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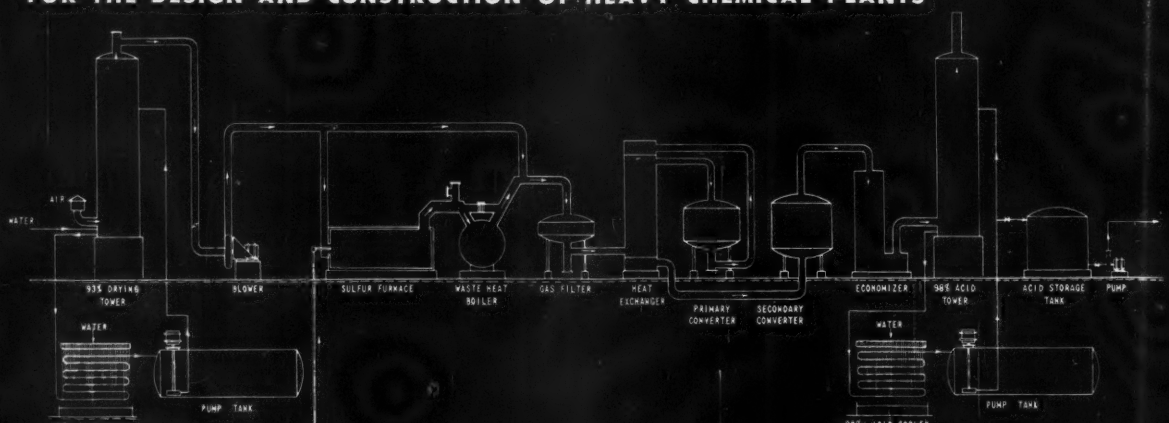

FLOW DIAGRAM
TYPICAL CHEMICO CONTACT
SULFURIC ACID PLANT

Here are the broad, start-to-finish *steps Chemico takes to make certain that every plant they build will be a* profitable investment.

INITIAL INVESTIGATION — Each Chemico project is specifically planned to meet individual needs. Before engineering designs are started, Chemico checks type of available utilities, elevation of plant site, soil conditions . . . in fact, every factor that might influence the design of the plant.

PROVED PROCESSES — Chemico has pioneered in the development of improved processes that help increase production quality and quantity. Chemico will either adapt these advanced, plant-proved processes to your particular problem . . . or, in some cases, develop entirely new processes.

MAN-HOUR MATHEMATICS—Carefully calculated, too, are the means to make every man-hour most productive . . . and to reduce over-all manpower requirements through automatic operation, centralized control and efficient plant layout.

MINIMUM MAINTENANCE — The process used, the selection of equipment, the plant layout—all are analyzed with an eye to simplifying maintenance problems. In a Chemico-built plant, repairs are never "hard to get at".

COMPLETING THE CONTRACT — Chemico makes certain that over-all guarantees are met before turning over the plant to the purchaser. And Chemico trains the operating crew to assure smooth-running, efficient operation.

These add up to *one contract—one responsibility.* During the past 35 years, Chemico has built hundreds of heavy chemical plants throughout the world. That's proof of Chemico's successful experience.

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Chemico Plants are Profitable Investments

CC 179

dome of the power unit, its only connection with the moving mechanism is by a frictionless spring.

A large range of corrosion resistant trims and hard facings when necessary are available to take care of the most severe conditions.

• QB835 The Michigan Pipe Co. is now producing large size steel pipe and fittings lined with saran rubber 187 in all standard sizes from 8"-36". The development complements the line of *saran lined pipe* in smaller size ranges which for some months has been manufactured by The Dow Chemical Co. and distributed through the Saran Lined Pipe Co. Standard fittings lined with saran 187 are also produced. On special order, the company will fabricate pipes with thinner or thicker steel wall sections.

The standard saran rubber lining is ⅛" thick and, in general, its operating temperatures range from —5° F. to 167° F. dependent somewhat on service conditions.

• QB836 R-S Products Corp. has developed a 36" by 8" 150-pound class B steel *dual valve,* No. 725, for an operating temperature of 1000°F. Body casting is chrome-molybdenum steel. Powered by separate electric motors, each alloy steel vane is operated independently of the other insuring close control of volume and pressure.

• QB837 A new closed-type unbreakable *rubber-coated container* for carrying acids, alkalis and other corrosive solutions without danger of spilling is announced as available in 1, 3, and 5 gallon sizes from Automotive Rubber Co., Inc.

The new container is similar to their other solution handling utensils with perforated steel shell sandwiched between ⅛" coatings of seamless rubber or synthetics.

Inner and outer coatings are tied through the perforations for permanent adherence and leave no metal exposed. Both carrying and tipping handles are covered, and rubber stoppers are included for top and spout.

• QB838 The clarity or turbidity of transparent liquids flowing under pressure through pipe lines can now be observed by means of a *valve type sight glass,* manufactured by Worthington Pump and Mach'y Corp.

Differential pressure is established across the deflector to allow some of the liquid to circulate continuously through a glass observation bowl. A special feature is provided by the valve which permits the removal of the observation bowl for cleaning.

• QB839 The new Dazey *heavy-duty can opener* has a double-angle cutting and feed wheel which can handle can rims of all sizes. For cutting many cans of the same size a support can be adjusted to cutting position. For larger cans the cutting head can be reversed 180° and then operated in the usual manner.

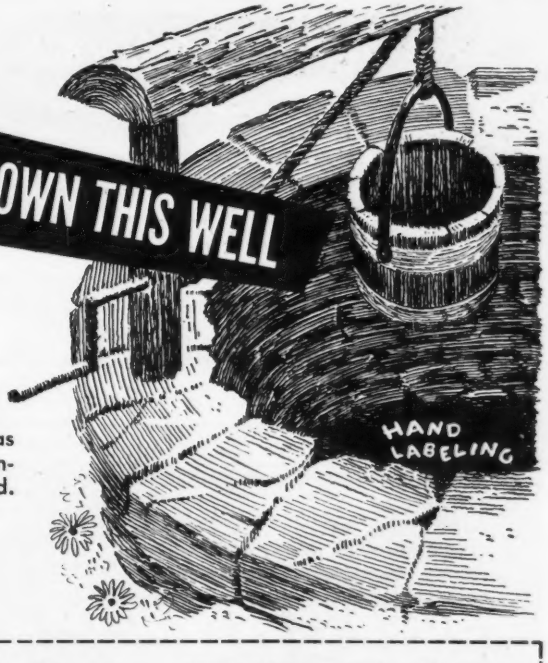
• QB840 A new *vacuum pump* is now being made available by Eitel-McCullough, Inc. Named the HV-1, the pump is an oil-diffusion type, originally designed by Eitel-McCullough engineers for their own use in the manufacture of vacuum tubes.

According to the manufacturer, the HV-1 has many outstanding features, including: speeds up to 67 liters per second, attainable vacuum of 4 x 10^{-7} mm Hg, clear glass pump barrel, no liquid cooling, no charcoal trap, no mechanical wear, and simplicity of mounting and maintenance.

• QB841 Hardinge Co., Inc., has secured manufacturing and sales rights to an accurate and rugged sampler, the Hardinge *automatic sampler.* The sampler takes periodic "cuts" (or samples) from a stream of moving material, either wet or dry, at any stage in a continuous process.

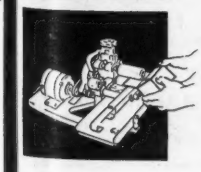
The unit is entirely automatic and can be set to operate periodically at a variety of time intervals from 5 to 60 minutes. When activated by a time switch, the sample cutter moves horizontally at a constant speed across the stream of mov-

DON'T THROW YOUR MONEY DOWN THIS WELL



Potdevin Labelers are a **one time** investment that will save you time every day, money every pay day. Initial price is low—installation costs nothing—any worker can operate a Potdevin. With daily cleaning and weekly lubrication your Potdevin lasts a lifetime.

And while you're writing for a Labeler—on 10 days free trial—consider a Potdevin Carton Gluer to speed up shipping operations. It's power driven—puts glue on carton flaps as fast as your men can handle them. Saves adhesives by controlling the glue film—applying it only where it's needed.



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ing material, diverting a representative sample into a sampling launder or container.

• QB842 Many applications of rotary pumps require a drive other than direct drive. Here, a certain amount of radial load is generally encountered on the pump shaft, which has a tendency to distort the drive shaft and rotating elements of the pump.

Worthington Pump and Machinery Corp. is now producing a new *inboard bearing construction* on their line of GR *rotary pumps,* to take the load off the main pump bearings, resulting in longer life and more rugged pump.

The bearing is an adapter type bearing designed so that the inner race is locked to the drive shaft, close to the load center. This eliminates necessity of the user installing separate outboard pedestal bearings and base.

• QB843 A new *plastic-coated cotton work glove* has just been put on the market by The Milburn Co. The new glove will not crack or peel; does not become slippery when immersed in oil, water or solvents; and is water, acid, caustic and petroleum solvents proof. The manufacturer claims that on comparable jobs, Plyglov will outwear 10 pair cotton or 4 pair synthetic rubber gloves.

• QB844 A new line of *twin strainers* is available from the Accessories Dept. of Elliott Co. They are built in sizes up to 24" to remove foreign matter from water, oil, and other liquids at pressures up to 125 and 250 psi. Constructed with two strainer chambers in one body, either chamber can be shut off for removing and cleaning the strainer basket without interruption of flow. Having no moving parts except valve mechanisms, little maintenance is required. An outstanding feature is their remarkably low pressure drop, due to the "straight-line" flow and large basket area. These sturdily built strainers have cast Meehanite bodies with steel plate doors. Baskets are of hard copper mesh on rigid frames. By using carefully selected metals, electrolysis is greatly minimized.

• QB845 The new Jerguson solid-wedge type *gage illuminators* give evenly diffused light over the entire length of the gage glass with no glare spots or blinding areas.

The new gage illuminators incorporate the principle of solid-wedge lighting in combination with plastic, whereby the illumination from a single light source is reflected from an angular surface and flows with evenly diffused intensity through the transparent gage glass.

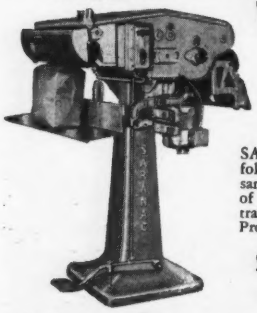
They are made in both explosion-proof and standard models for all sizes of transparent gages. They are also made in both single and double section styles. Lighting is by a standard small bulb. Illuminators are equipped with aluminum brackets for mounting on the top two cover bolts of the gage section.

• QB846 Alsop Eng'r. Corp. has added a line of air-tight *storage and settling tanks* (non-pressure) to it's line of stainless steel mixing tanks. They are all welded and constructed of 16 gauge stainless steel. The all rounded corners, highly polished, crevice-free surfaces and fast, self-draining bottoms make them simple to clean and keep sanitary.

The stainless steel cover with heavy rubber gasket features a 2" center opening with rubber cork for easy filling or may be had with standard I.P.S. or sanitary fittings. One or more faucets can be supplied for settling tank usage. Tanks are available with flat or sloping bottom. Sizes from 5-250 gals. are carried in stock.

• QB847 A new *plastic filter frame,* that is resistant to both acids and alkalis even at higher temperatures, is available from Hercules Filter Corp. This frame is tough and not breakable in handling. They will withstand high temperatures, showing no softening or deterioration at 300° F.

SEALS FILLED BAGS QUICKLY ECONOMICALLY!



One operator produces up to 75 sift-proof closures per minute—paper bags, bags with liners, glassine bags, up to 10" wide—with a SARANAC Bag Sealer. A single pass through the SARANAC forms a stapled double reverse fold that is the strongest part of the bag. The same machine is used to close the bottoms of empty bag tubes. Write for free illustrated bulletin and ask about the SARANAC Proposition.

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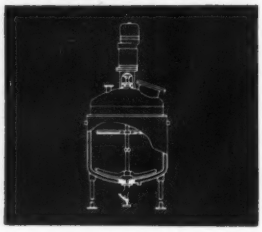
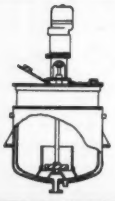
*5 *Patterson-Kelley Solutions to your Kettle problems*



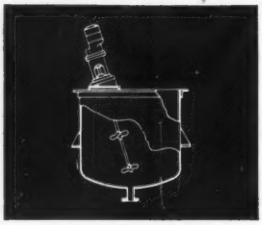
A Kettle with modified paddles

General purpose mixer for heavy materials.



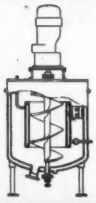
B Asbestos Mixer

With draft tube and turbine; adaptable also for use in mixing other fibrous materials.



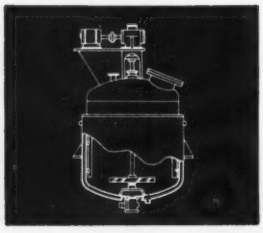
C Open Top Mixer

Suitable for a variety of mixing operations involving liquids up to medium viscosity, or for keeping light solids in suspension.



D Soap Crutcher

Used for mixing and blending soap in paste form; also suitable for other pasty or fibrous materials.



E Kettle with turbine and baffles

Suitable for mixing liquids of low or medium viscosities, slurries; for suspending heavy solids; good for dispersions and rapid dissolving.

Patterson-Kelley offers, without obligation, its accumulated experience to recommend the most suitable design and material for specified operating conditions.

**First of a series of kettles and their applications.*

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• QB848 Worthington Pump and Machinery Corp., has added a new *rotary pump* line known as GAMI. The new pump uses a mechanical seal and a self lubricating type inboard sleeve bearing to carry overhung drives. This seal and bearing assembly are interchangeable on the same shaft with the standard stuffing box of the GA type pump. If service conditions change, substitutions of seal or stuffing-box can be easily made. The seal is subject to suction pressure only, and has been found tight even at high vacuum. The new line, ideally suited to installations requiring high vacuum and a drip-proof construction, are designed for handling liquids comparatively free from abrasive or corrosive substances, and are capable of handling a considerable amount of air or gas in the liquid.

• QB849 Whiton Machine Co. has developed a small *vertical steam turbine* capable of developing 90 BHP. It is available in either semi-steel or cast steel. The standard machine can take thrust loads in either direction up to approximately 1500# and can be changed to take even higher loads.

This turbine is equipped with both constant speed and emergency governors. Pump governors can be built into the machine. Equipment also includes a bolting flange at the lower part of the casing to permit bolting to the flange of the driven unit.

LABORATORY EQUIPMENT

Colorimeter LE 144

The new Rouy Photrometer, made by E. Leitz, Inc. gives a concentration reading accurate to within 0.1%.

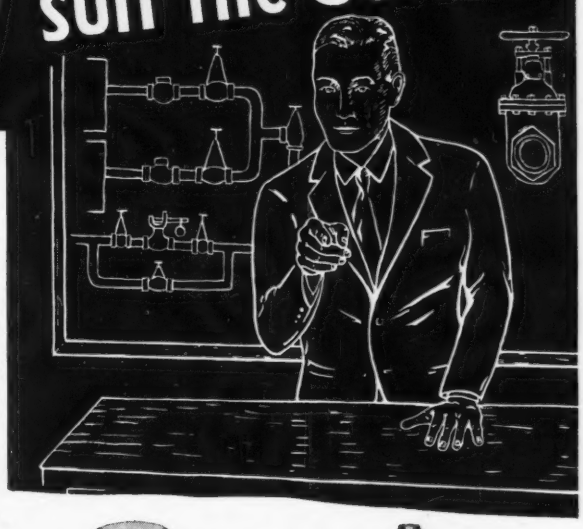
Such accuracy in colorimetric analysis is made possible by careful matching of the photoelectric cell and the direct reading microammeter. With the Photrometer, the measured electrical energy is strictly linear to the transmitted light energy.

The Photrometer's ten narrow band (40 millimicrons) glass filters give finer definition over the entire visible spectrum. Each filter and filter element is controlled in production and matched to produce identical spectral transmission curves. Further accuracy is insured by the use of a precision square absorption cell which eliminates curved cell errors.

All adjustments are made with a single control. Once calibrations have been set up, any competent worker can make routine analysis in minutes, where ordinary methods may require hours.

The compact, lightweight Photrometer takes a 115-volt AC line. Where only DC is available, terminals are provided for connection to a 6-volt storage battery.

1st Lesson in Flow Control – the Valve *MUST* suit the Service



It's an established fact that there's more loss in time and money through misapplication of valves than from any other known cause.

Fortunately this can be avoided. All you need to do is standardize on the Powell Line of Valves*—because this is what you get—

I More varieties and patterns than are made by any other manufacturer of valves.

II The most complete line of Standard Designs, made of standard materials, for use wherever they fill the requirements of the service.

III Many Special Designs for Special Services.

IV Valves made in the greatest variety of materials ever used in making flow control equipment.

With such facilities at your disposal and Powell Engineers always ready to help you select the right valves, why take chances with your flow control equipment. Standardize on POWELL VALVES.

*** Powell Valves are made in Bronze, Iron, Steel and a wide selection of Corrosion-Resistant metals and alloys. Valves of every type—Globe, Angle, Gate, Check, Non-return and Flush Bottom Tank Valves—are included in the Complete Powell Line.**

Fig. 1847 — 200-pound Stainless Steel Swing Check Valve. Screwed-in cap and regrindable, renewable disc.

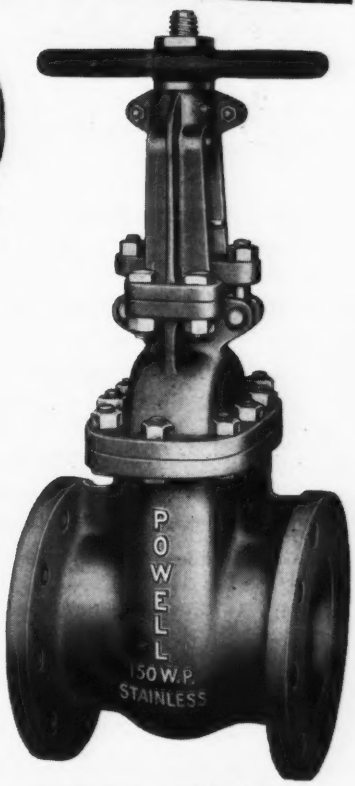


Fig. 2453-G—Large 150-pound Stainless Steel Gate Valve. Bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge. Made in sizes 5" to 30", inclusive.

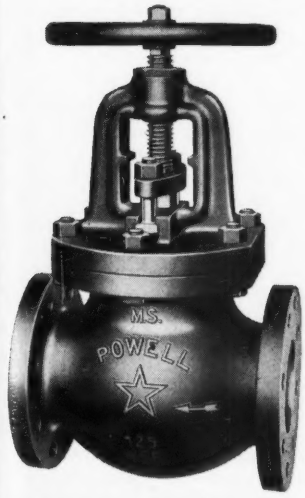


Fig. 241—125-pound Iron Body Bronze Mounted Globe Valve with outside screw rising stem, bolted flanged yoke, regrindable, renewable bronze seat and disc.

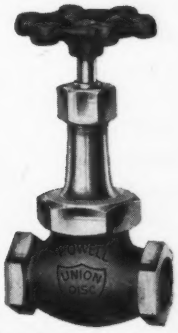


Fig. 150—150-pound Bronze Globe Valve with screwed ends, union bonnet and renewable composition disc.

Fig. 375 — 200-pound Bronze Gate Valve. Screwed ends, union bonnet, inside screw rising stem and renewable "Powellium" wear-resisting nickel-bronze disc.

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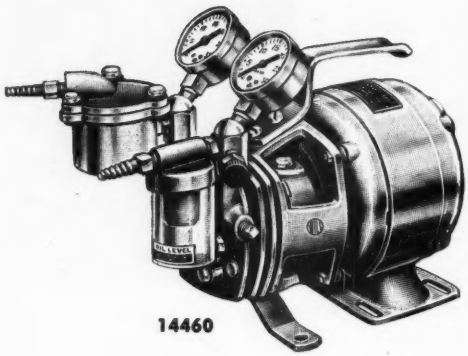
POWELL VALVES

PORTABLE ROTARY AIR PUMP



14460

This "Deluxe" Gast Rotary Air Pump is a convenient portable model for moderate vacuum and pressure work in the laboratory.

Dial faces are slanted upward for easy reading. Finish is in "Ivory" enamel with highly polished nickel-plated fittings.

It is suitable for pressure up to 25 psi intermittently or 15 psi continuously. A vacuum of 27 inches can be reached with ease. The pump is an integral part of the driving motor and designed so that quiet operation and non-pulsating air delivery is obtained.

A dial type vacuum gauge of 2-inch diameter, graduated to 30" of mercury, indicates vacuum, and a pressure gauge of same diameter, graduated to 50 pounds, indicates operating pressure. Bleeder valve has fine adjustment. Motor is ¼ H.P.

14460 ROTARY AIR PUMP, as described. Complete with vacuum and pressure gauges, filters, carrying handle, cord, switch and plug. For 115 volts, 60 cycles A.C. **$68.85**

Pumps with other voltages and cycles available on special order

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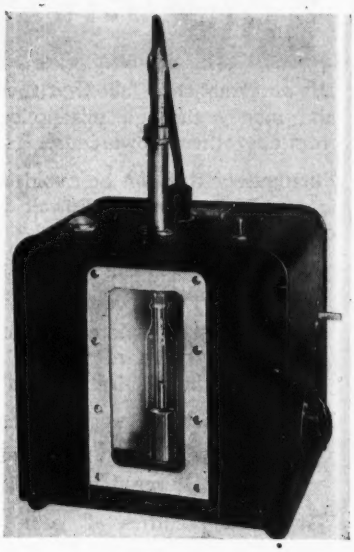
Manostat LE 145

Precision Scientific Co. has developed the Micro-Set manostat for regulating and holding a constant vacuum.

The new manostat is installed between a vacuum pump and a distillation system. It operates on a principle of controlled



leaks to atmosphere. Excess vacuum is leaked constantly, if necessary, through one end of a double glass stopcock. Leakage at the other end of the stopcock is controlled through a Micro-Set platinum-to-mercury regulator which actuates a solenoid (through a relay) to open or close a leak as needed.

The control sensitivity is better than 0.05 mm Hg and operates from atmospheric to absolute vacuum. Within any 100 mm range, the Micro-Set regulator is the only adjustment used. Glass parts are fitted with ground glass connections.

A white background behind the regulator aids in viewing the end of the platinum wire for making fine adjustments with the Micro-Set. A pilot light signals the on-off operation of the relay.

• LE146 Coleman Instruments, Inc., is marketing the new Coleman Model 6B junior *spectrophotometer* for the determination of oil color by the Tentative Method recently adopted by the American Oil Chemists Society. The well-known Coleman junior spectrophotometer is specifically calibrated in accordance with the recommendations and requirements of the new method.

• LE147 Tracerlab, Inc., is marketing the *beta gauge,* the first of a series of industrial measuring and control instruments. It represents one of the first major industrial uses of Oak Ridge produced radioactive isotopes. The essential components of the gauge are a source of beta radiation from strontium-90 and a radiation detector. The sheet material to be

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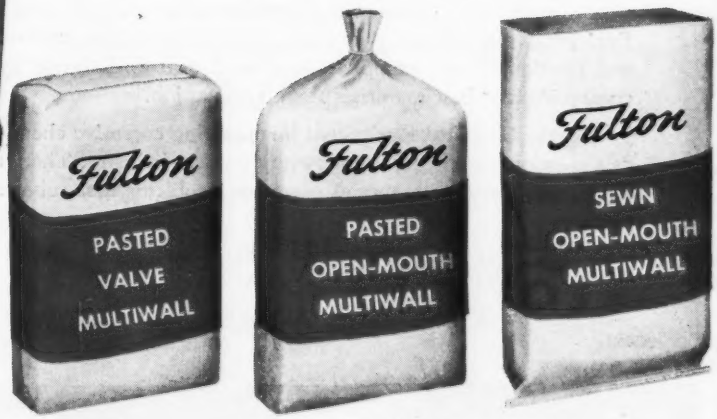
Whatever your Multiwall requirements may be—pasted or sewn bottom, open mouth or valve—Fulton makes them in every size.

The Multiwalls we are turning out are winning compliments on every hand for their clean cut appearance and uniform high quality of workmanship. Try Fulton on your next order for Multiwalls—set your own standards for quality—see for yourself that Fulton Multiwalls measure up.

FULTON IS GEARED to give you complete bag service in both Textile and Multiwall bags. Call on us.



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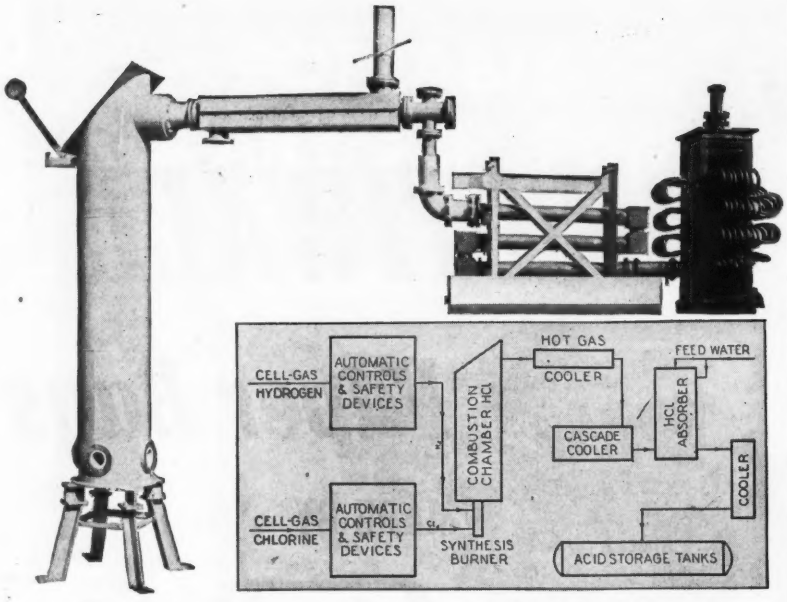

Illustration and flow sheet of plant to make 36% hydrochloric acid from chlorine and hydrogen.

Our Business Is Solving CORROSION PROBLEMS

Thru the years Knight engineers have solved a great variety of corrosion problems. With this wide experience they have designed many types of acid- and alkali-handling equipment to meet the conditions of individual customers' problems. Besides our own, they use many other types of materials to develop successful functional units.

Some of the Knight products they use are: *Knight-Ware,* an acid- and alkali-proof chemical stoneware; *Permanite,* a new resin material that is used alone or reinforced with glass fabric; and *Pyroflex,* a thermoplastic resin. Depending on the needs of the job, Pyroflex construction often includes steel, Pyroflex, Knight-Ware, Permanite, rubber, lead, glass, carbon and plastics. Thus a complete functional unit is designed by combining the best materials for a specific job.

Knight Chemical Equipment for handling corrosive chemicals is being used in just about every process industry. That is why those faced with special corrosion problems first submit them to—

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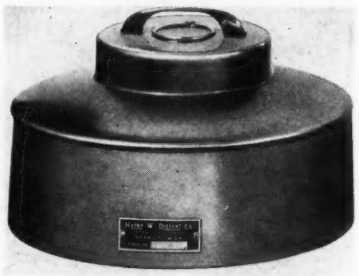
CHEMICAL EQUIPMENT

measured is interposed between the source and the detector and a part of the radiation is absorbed by the sheet material in proportion to its weight per unit area. Weight per unit area or thickness is read on a properly calibrated recorder connected to the detector. The recorder scale can be calibrated in terms of a plus or minus deviation from specifications or as an absolute thickness or weight reading.

• LE148 Harry W. Dietert Co. has introduced an improved *desiccator,* the "Speed Desiccator." The No. 5510 is fast cooling because it is constructed of aluminum in-



stead of low heat conductivity glass. It has a high heat capacity because the bottom and wall sections average about one half inch in thickness. Hence, any material placed in the Speed Desiccator is cooled to room temperature quickly due to the high heat conductivity and thermal capacity of the desiccator. The desiccator measures 10½" I.D. x 3¼" deep. The desiccant used is silica gel.

A window is incorporated in the cover to observe the condition of the silica gel for reconditioning when its color changes from blue to pink.

• LE149 The new Series 1500 bench-type Temco *electric furnaces* of the Thermo Electric Mfg. Co., employ their patented Temcometer stepless and wasteless temperature controller. By adjustment of the control knob, the current input can be regulated anywhere from 5% to 100% time "on" and any desired temperature from 350° F. to maximum of 1650° F. continuously and 1900° F. intermittently can be selected and held. Heating elements are embedded in refractory plates forming the sides, top and bottom of the heating chamber and are interchangeable without dismantling the furnace.

• LE150 Applied Research Laboratories are now producing their SQA (*spectrograph Quantometer adapter*) adapters which may readily be attached to present spectrographs for conversion to a direct reading instrument. A new spectrographic source unit has been designed to provide the routine control laboratory with an inexpensive dual purpose source. The spark-arc source unit fills the requirements of most laboratories for a source unit for the precision analysis of elements at the higher concentrations.

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COAL TAR CHEMICALS

Cresylic Acid
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High Boiling Tar Acids
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Methyl Formate
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Must Study Regs in Shipping Hazardous Chemicals

Hazardous chemicals for shipment under the regulations of the Interstate Commerce Commission are classified in the regulations as follows: inflammable liquids, inflammable solids and oxidizing materials, corrosive liquids, compressed gases and poisonous articles. Since all hazardous articles for shipment fall into one of these categories, it is well for shippers to become acquainted with the Interstate Commerce Commission definitions covering these classifications:

The following definitions apply:

INFLAMMABLE LIQUIDS: An inflammable liquid is any liquid which gives off inflammable vapors (as determined by flash point from Tagliabue's open-cup tester, as used for test of burning oils) at or below a temperature of 80° F.

INFLAMMABLE SOLIDS AND OXIDIZING MATERIALS: An inflammable solid is a solid substance other than one classified as an explosive, which is liable, under conditions incident to transportation, to cause fires through friction, through absorption of moisture, through spontaneous chemical changes, or as a result of retained heat from the manufacturing or processing.

An oxidizing material is a substance such as chlorate, permanganate, peroxide, or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter.

CORROSIVE LIQUIDS: Corrosive liquids are those acids, alkaline caustic liquids and other corrosive liquids which, when in contact with living tissue, will cause severe damage of such tissue by chemical action; or in case of leakage, will materially damage or destroy other freight by chemical action; or are liable to cause fire when in contact with organic matter or with certain chemicals.

COMPRESSED GASES: a) Compressed gas for the purpose of these regulations is defined as any material or mixture having in the container either an absolute pressure exceeding 40 pounds per square inch at 70° F., or an absolute pressure exceeding 104 pounds per square inch at 130° F., or both; or any liquid inflammable material having a Reid* vapor pressure exceeding 40 pounds per square inch absolute at 100° F.

b) Any compressed gas, as defined above shall be classified as an inflammable compressed gas if either, (1) a mixture of 13 per cent or less (by volume) with air forms an inflammable mixture†, or (2) the inflammability range† with air is greater than 12 per cent regardless of the lower limit.

POISONOUS ARTICLES: Poisonous articles for the purpose of these regulations are divided into four classes according to degree of hazard in transportation.

Poisonous gases or liquids of such nature that a very small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life. This class includes the following: chlorpicrin, cyanogen, cyanogen chloride containing less than 0.9 per cent water, diphosgene, ethyldichlorarsine, hydrocyanic acid, lewisite, methyldichlorarsine, mustard gas, nitrogen peroxide (tetroxide), phenylcarbylamine chloride, and phosgene (diphosgene). Note: Dilute solutions of hydrocyanic acid of not exceeding 5 per cent strength are classed as poisonous articles, class B.

Poisonous liquids (including pastes and semi-solids) are substances of such nature that they are chiefly dangerous by external contact with the body or by their being taken internally as in contaminated food or feeds.

The vapors of some of this class of materials are also offensive or dangerous, but to a much less extent than class A poisons.

Poisonous solids (including pastes and semi-solids) are substances of such nature that they are chiefly dangerous by external contact with the body or by their being taken internally as in contaminated food or feeds.

Tear gases are liquid or solid substances which upon contact with fire or when exposed to air give off dangerous or intensely irritating fumes, such as brombenzyl cyanide, chloracetophenone, diphenylaminechlorarsine, and diphenylchlorarsine, but not including any poisonous article, class A.

Closing and cushioning: All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

It shall not be permissable to transport class C poisons if there be any interconnecting means of any character between the containers.

In addition to these definitions, a new definition has recently been promulgated, entitled Radioactive Materials—Class D Poison.

The regulations for the transportation of explosives and other dangerous articles contain a commodity list of explosives and other dangerous articles showing into which category certain of the well-known hazardous products is placed under the regulations. However, for products not listed in the commodity list, it is necessary to consult the definition of the hazard for the product involved and in order to properly ship it must be classified under the particular hazard as shown by the definition. All products which are classified as hazardous require specific packing, labeling, and marking which is a part of the regulations. It is very essential for the protection of the shipper, transportation carrier, and consignee that the proper classification of all hazardous products be determined by the shipper and compliance with the regulations made mandatory by all who ship hazardous chemicals.

Plastic Bottle Factor In New Process

An investment of several hundred dollars in plastic bottles enables gum turpentine farmers of the South to realize

an increase in profits estimated at thousands of dollars. The availability of the sixteen-ounce plastic bottle, which is blow-molded of polyethylene by Plax Corp., Division of Hartford Empire Co., Hartford, Conn., made possible a radically improved method of treating pine trees.

This new method involved spraying a fresh streak on the tree with sulphuric acid. The plastic bottle played a vital part, because it provided a leak-proof, light-weight, and, unbreakable container in spray guns for this highly corrosive chemical. Attendants could safely, quickly

* American Society for Testing Materials method of test for vapor pressure of petroleum products.

† These limits shall be determined at atmospheric temperature and pressure. The method of sampling and the test procedure shall be acceptable to the Bureau of Explosives. The inflammability range is defined as the difference between the minimum and maximum percentage by volume of the material in mixture with air that forms an inflammable mixture.

Have Packaging Problems got you up a tree?

Throughout the chemical industries,
St. Regis Multiwall Paper Bags are providing
new answers to both new and old packaging problems.

ST. REGIS PACKAGING

- ★ cuts labor and container costs
- ★ provides chemical products with specific protection against specific hazards (moisture and contamination, for instance)
- ★ speeds packaging operations

No wonder producers of more than 400 different commodities rely on rugged, economical Multiwalls to deliver the goods in better condition.

If there isn't a St. Regis Multiwall *now* that meets the exact requirements of your product, we probably can *make* you one. St. Regis Research and Development men will be glad to talk over your particular problems, with no obligation on your part—glad to help engineer a bag that meets your specific needs. Just get in touch with your nearest St. Regis Sales Office.

MADE FOR EACH OTHER!

St. Regis Multiwalls and *St. Regis Valve Bag Filling Machines* are the logical combination *for swift, efficient, economical packaging.* If you pack a granular, pulverized or powdered product, it'll pay you to find out about a complete St. Regis Packaging System. Full details are yours for the asking, from your St. Regis Sales Office.

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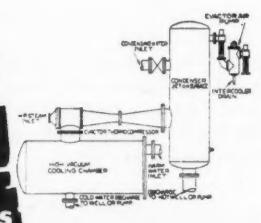
NOW is the TIME to consider next summer's COOLING REQUIREMENTS



Too bad, but it's too late to order a CHILL-VACTOR for use this summer. If this equipment could be stocked on shelves we'd be glad to ship your order tomorrow. Trouble is, it takes three or four months to design, build and ship a complete CHILL-VACTOR unit.

That is why you ought to start thinking NOW about ordering your CHILL-VACTOR for next summer's cooling requirements. You should begin now to assemble your data, check your capacity requirements, and be ready to specifiy equipment which will provide maximum benefit.

CHILL-VACTOR equipment answers the need of chemical and process industries for:

Maintaining proper temperatures in certain solutions.
Chilled water for air conditioning.
Chilling various reaction vessels.
Special cooling requirements.

The Croll-Reynolds CHILL-VACTOR is one of the most dependable and efficient units available for many cooling requirements in the range above 32° F. It has no moving parts other than a standard chilled water circulating pump. Water is the only refrigerant.

Maintenance and repair costs are practically nil. Operating costs are usually less than for other types of refrigerating equipment where ample condenser water is available.

Inquiries will receive the careful attention of engineers with many years specialized experience in the field. An engineering survey can be arranged without cost or obligation.

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CHILL VACTORS STEAM JET EVACTORS CONDENSING EQUIPMENT

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and conveniently spray the acid exactly where it was required.

Many members of the American Turpentine Farmers Association Cooperative of Valdosta, Ga., found that the new technique both increased the flow of gum and prolonged the flow period, permitting gum farmers to get as much gum from chipping every two weeks as they did by the traditional method of chipping every week.

In addition, with the acid treatment it is only necessary to chip through the bark of the tree to the surface of the wood. Under the old technique, it was necessary to chip deeper into the wood.

New Safety Chart on Chlorine

A new chlorine safety precaution chart has been prepared by the Solvay Sales Division, Allied Chemical & Dye Corp., for distribution to persons and companies using or handling liquid chlorine.

The chart, measuring 16½" x 23", is designed to be hung wherever chlorine is handled. It contains information regarding emergency procedure in case of leakage, first aid recommendations, as well as general chlorine handling precautions. The chart is printed on a heavy yellow backing and varnished to withstand exposure.

This precaution chart is available without obligation from the company at 40 Rector Street, New York 6, N. Y.

Newark Paper Box Buys G. V. Clark Co. Division

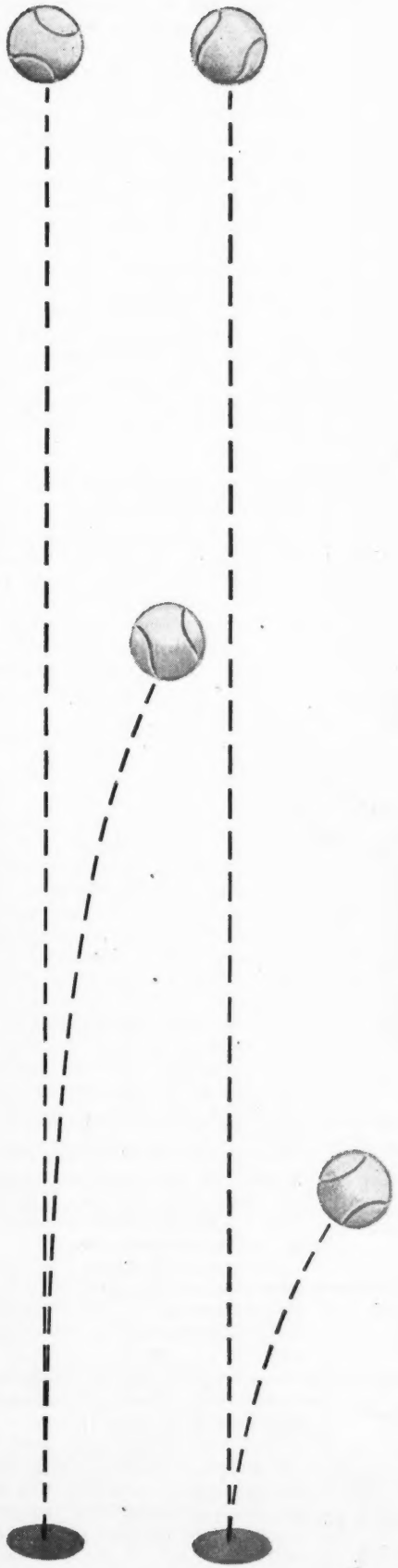
Newark Paper Box Co., Newark, N. J., has purchased the entire production facilities of the See-Thru Division of the George V. Clark Co., Inc., Astoria, L. I., manufacturers of rigid transparent set-up boxes.

This new acquisition, in combination with Newark's present diversified set-up box facilities, will provide one of the most comprehensive packaging services in the East. Utilizing cardboard, acetate and metal, an infinite variety of combination packages will be produced.

Richard M. Monahon, who has been vice-president in charge of sales and advertising for George V. Clark Co., Inc., will join Newark Paper Box Co. as director of acetate sales.

Courier Service Speeds Pharmaceutical Delivery

A newly developed "courier" service which combines the fastest available facilities both on the ground and in the air is attracting attention in shipping circles, especially among those concerned with shipping pharmaceuticals. A number of the larger drug houses have recently been employing this service which makes it unnecessary for local outlets to carry



Getting "more bounce" into your business

Some 15 years ago a simple packaging trick put more bounce into tennis balls.

The trick—putting them in a key-opening can under pressure—pleased everybody.

Inventories could be built up in slack seasons without fear that the tennis balls would go stale.

Shelf and window displays could be made in sporting goods stores easily.

Players had tennis balls with more bounce . . . any time . . . any place.

Perhaps similar expert packaging advice on the part of American Can Company will get "more bounce" into your product.

Canco know-how in devising new and better packaging methods has paid off in extra profits for others for 48 years. Maybe it can do the same for you.

AMERICAN CAN COMPANY

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Available in commercial quantities

The least expensive source of the cyanate radical is provided by Sodium Cyanate. It is used in organic synthesis for making substituted ureas . . . medicinals for the treatment of amebic type infections, synthetic resins and plastics. Sodium Cyanate also has possibilities in the control of weeds and as an ingredient in metal hardening baths.

PROPERTIES

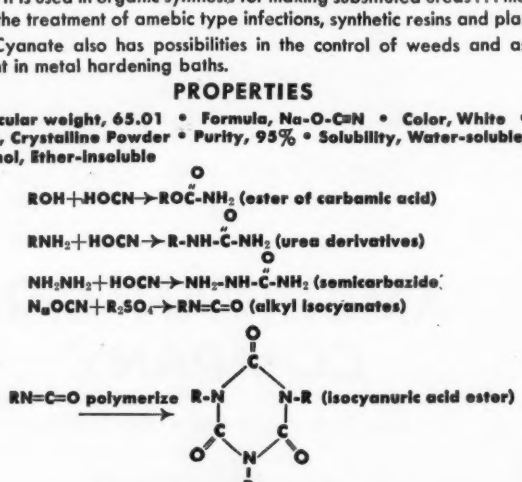
Molecular weight, 65.01 • Formula, Na-O-C≡N • Color, White • Form, Crystalline Powder • Purity, 95% • Solubility, Water-soluble, Alcohol, Ether-Insoluble

$ROH + HOCN \rightarrow ROC(=O)-NH_2$ (ester of carbamic acid)

$RNH_2 + HOCN \rightarrow R\text{-}NH\text{-}C(=O)\text{-}NH_2$ (urea derivatives)

$NH_2NH_2 + HOCN \rightarrow NH_2\text{-}NH\text{-}C(=O)\text{-}NH_2$ (semicarbazide)

$N_aOCN + R_2SO_4 \rightarrow RN=C=O$ (alkyl isocyanates)



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Emery Air Freight Corp., 314 East 39th St., New York City, is offering this national service and reports instances in which drugs are picked up at their point of manufacture, rushed to the nearest air transportation point, and taken off the plane by the company representative at the field nearest the place they are needed and carried by the fastest ground means to the point of use. As much as three days can be lopped off some origin-to-destination schedules by this service.

In addition to the use of this service in the drug field, it makes possible fast delivery of radio-active isotopes, and the laboratory of the Atomic Energy Commission at Oak Ridge, Tenn., regularly employs Emery for such shipments.

Air Transport Rules for Dangerous Articles

Civil Air Regulations, Revised, Part 49, covering the transportation of explosives and other dangerous articles have been promulgated by the Civil Aeronautics Board and went into effect July 20, 1949. These regulations cover shipment of explosives and other dangerous articles on both passenger-carrying aircraft and cargo aircraft.

H. R. Bill 3940 is now in the Congress. This is an enabling act which gives these regulations full legal status and will place the burden of compliance with the regulations together with adequate labelling of the product upon the shipper.

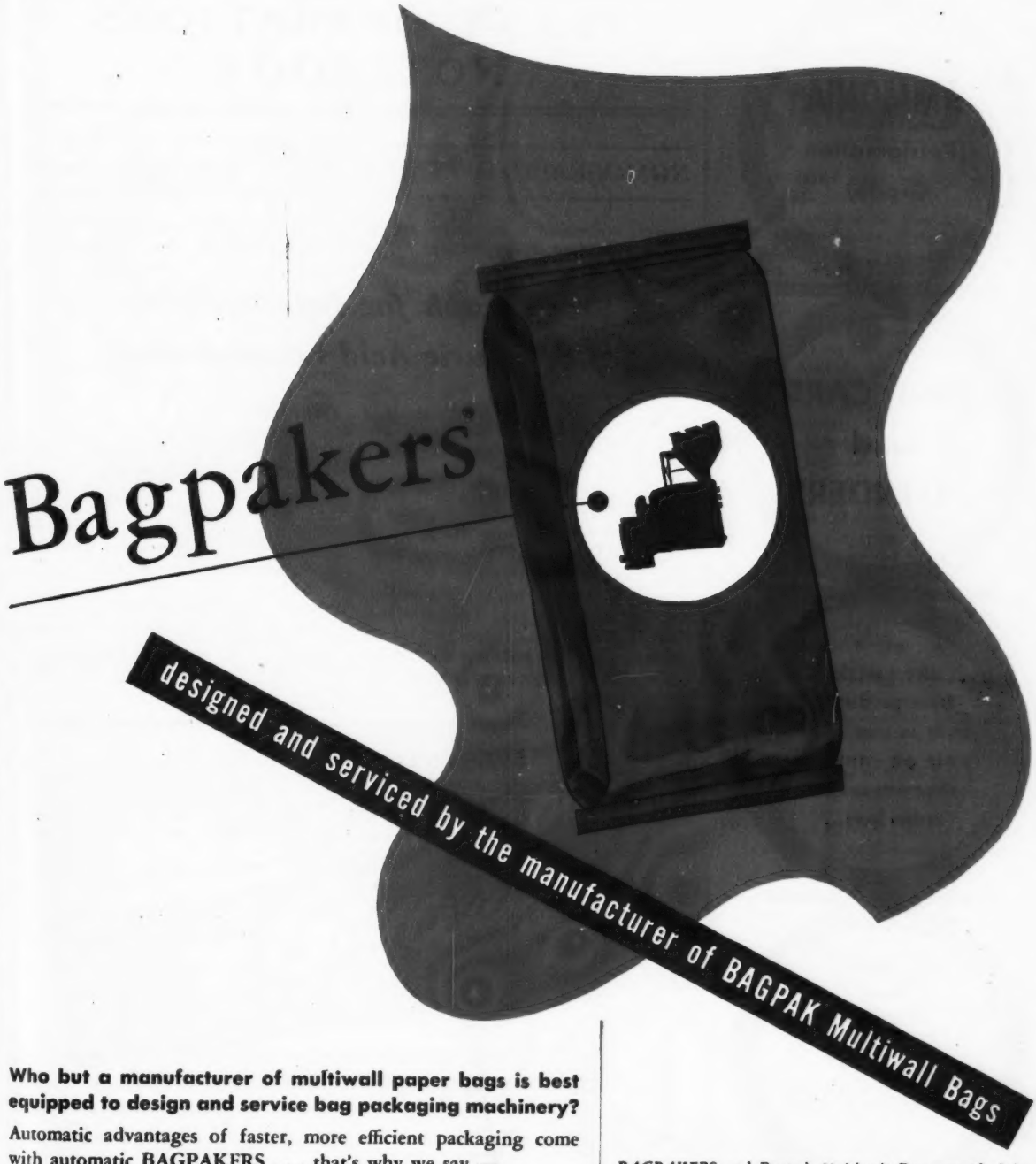
The following statement on a shipping label signed by a responsible agent of the shipper must be applied to each package of explosives or other dangerous materials shipped by air according to this regulation: "This is to certify that the contents of this package are properly described by name and are packed and marked and are in proper condition for transportation according to the regulations prescribed by the Interstate Commerce Commission and the Civil Aeronautics Board.

In addition to the above statement, for shipment on passenger-carrying aircraft the following must be added: "This shipment is within the limitations prescribed for *passenger-carrying aircraft.*"

Any operator of aircraft may rely on these certificates as *prima facie* evidence that the shipment so certified complies with all the requirements of the regulations.

It is essential to refer to the regulation for the quantity allowed and packing prescribed for dangerous articles.

There are two appendixes which accompany the regulation entitled "Items Prohibited from Transportation by Air" and "Items Prohibited from Transportation by Air on Passenger-Carrying Aircraft."



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Automatic advantages of faster, more efficient packaging come with automatic BAGPAKERS . . . that's why we say —

if you want — **a packaging machine that sews a multiwall tighter and faster — rely on a BAGPAKER . . .**

if you want — **an automatic machine that weighs, fills, settles and seals better — rely on BAGPAKER . . .**

if you want — **a real performer — a dependable machine that boosts and maintains production rates — rely on BAGPAKER.**

BAGPAKERS and Bagpak Multiwall Bags are ideal for packing food, chemicals and fertilizers. Write for our booklet 200B—it will give you added information on these money- and labor-saving machines and multiwall bags.

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PLANT OPERATIONS NOTEBOOK

NOMOGRAPH-OF-THE-MONTH

Edited by DALE S. DAVIS

Readers are invited to submit for publication in this department any original nomographs pertaining to chemistry or engineering. $10 will be paid for each one used.

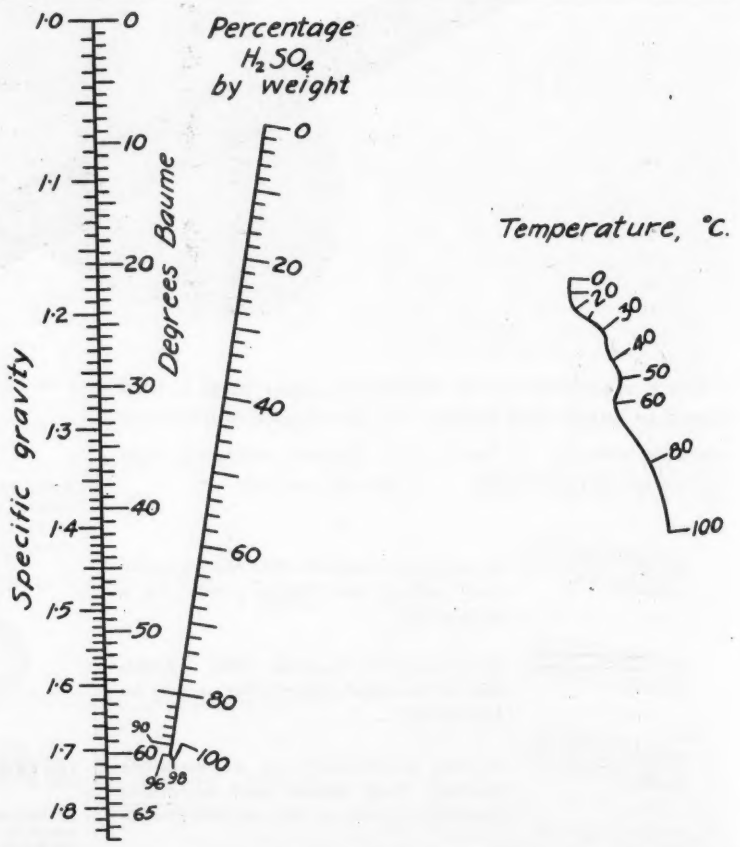
Nomograph for Determination of Sulphuric Acid Concentration

by H. A. C. CHERMIN
Staatsmijnen in Limburg,
Geleen, Netherlands

THE percentage by weight of sulfuric acid in its aqueous solutions can be determined by means of the accompanying line coordinate chart which was prepared from specific gravity data (2) by a method described by Lo-Ho (1). The use of the chart is illustrated as follows: What is the percentage of sulfuric acid if its aqueous solution has a specific gravity of 1.150 at 50° C.? Connect 1.150 on the specific gravity scale with 50 on the temperature scale and note the intersection with the weight percentage scale at 24.

Literature Cited

(1) Lo-Ho, J. Franklin Inst., pp. 227-244, March 1948.
(2) Perry, J. H., "Chemical Engineers' Handbook", 2nd ed., pp. 428-429, New York, McGraw-Hill Book Co., 1941.



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U.S.P. glycerine is a food. It's almost as sweet as sugar. It's wholesome . . . nutritious . . . digests normally in much the same way as sugars and fats.

And—glycerine is a solvent and extractant for base flavors. It's a softener . . . a humectant. It adds smoothness to mixtures . . . distributes flavors uniformly.

You can find glycerine, too, in flavoring extracts . . . frozen foods . . . meat stamping inks . . . margerine emulsifiers . . . bread preservatives . . . cod liver oil emulsions—in almost every type of food product. Its combination of physical and chemical properties can be matched by no other substance.

That's why in the food industry—and in almost *every* industry—*Nothing takes the place of glycerine!*

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NEW YORK 17, N. Y.

Technical GLYCERINE NEWS

GLYCERINE SECTIONS OF BEILSTEIN TRANSLATED! Now available for the first time, an English translation of the Glycerine Sections of Beilstein's famous *Handbuch der Organischen Chemie* (4th Edition). Complete in *one* volume entitled "GLYCERINE AND SOME GLYCERINE DERIVATIVES." Publication authorized by the Attorney General of the United States. Compiled and edited by Dr. R. N. Du Puis, Dr. C. S. Miner, Jr. and J. B. Segur—long acknowledged as authorities in the field of Glycerine and its properties. Amassed in its 210 pages are an unusually large number of Glycerine derivatives with extensive cross-references. Also included are a complete table of contents and a detailed index of the derivatives and fatty acid esters of Glycerine. A timely, comprehensive volume for your chemical reference library. Order from the Glycerine Producers' Association enclosing $2.50 (check or money order) for each copy.

★ ★ ★

ARTICLES ON GLYCERINE NOW AVAILABLE WITHOUT CHARGE. Reprints of recent magazine articles on the use of glycerine in various phases of the food industry may be obtained by checking the appropriate item on the coupon below. The titles of these articles are: *Glycerine in Vanilla Flavors* (F-12), *The Use of Glycerinated Eggs* (F-13), and *Glycerine in Candy Coloring Compounds.* (F-14)

★ ★ ★

FOR DIRECT CONTACT FREEZING, glycerine, glycerine-salt, and glycerine-invert sugar solutions have been found by one experimenter to be more satisfactory than any of the other salt, syrup, or combination solutions tested for direct contact freezing. (F-15)

★ ★ ★

A VEHICLE FOR VANILLA contains corn syrup, glycerine U.S.P., and water. The solvent is said to be inexpensive, fluid, stable, and free from fermentation. (F-16)

GLYCERINE PRODUCERS' ASSOCIATION, DEPT. 3
295 MADISON AVENUE
NEW YORK 17, N. Y.

I should like to know the source of those items appearing in Technical Glycerine News which I have checked below.

☐ F-12 ☐ F-13 ☐ F-14 ☐ F-15 ☐ F-16

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COMPANY.....

ADDRESS.....

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ARMOUR *Glycerine Division*

Armour and Co., 1355 W. 31st St., Chicago 9, Ill.

MORE NEW RARE CHEMICALS

from Genesee Research Laboratories

alpha-naphthoic acid $C_{10}H_7$ COOH

Melting Point 159-160° C.
Appearance—White powder

beta-naphthoic acid $C_{10}H_7$ COOH

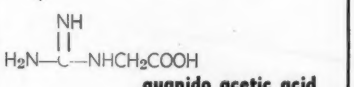
Melting Point 184-185° C.
Appearance—White powder

para-chlorobenzonitrile ClC_6H_4N

Melting Point 91-92° C.
Appearance—White powder

ortho-nitrobenzoic acid $NO_2C_6H_4COOH$

Melting Point 144-145° C.
Appearance—Cream color powder



guanido acetic acid

Dec. 280-284° C.
Appearance—white powder

GENESEE RESEARCH CORPORATION
572 Lyell Avenue
Rochester 6, New York

LABORATORY NOTEBOOK

Fast Dishwashing

An invisible coating of General Electric water repellent has reduced an eight-hour dishwashing chore to a few minutes of rinsing at the U. S. Rubber Co's. Naugatuck, Conn., laboratories, where production samples of sticky latex are daily drawn off into hundreds of small glass dishes for quality analysis.

U. S. Rubber's chemists said that the G-E silicone water repellent is the best material yet found by them to prevent the adherence of latex to glass. One laboratory employee who formerly spent a full day scrubbing petri dishes with abrasives now cleanses them quickly and economically with running water.

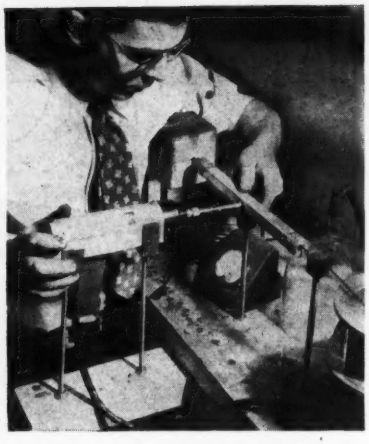
In use, Dri-Film, No. 9987, is thinned to a 10% solution before being poured into the dish. After the excess is drained off, the container is dried in a 200° F circulating oven for 15 minutes. Dishes so treated can be used and cleaned five times before another application is required.

Rare Chemicals

The National Registry of Rare Chemicals, 35 W. 33rd St., Chicago 18, Ill., is searching for the following materials.

2-Methyl-(1',2'-naphtho)-4,5-thiazole
4,6-Bis(chloromethyl)-1,3-xylene
Coriamyrtin
3,4,5-Trimethylphenol
1-Decalol
1-Decalone
1,2-Diaminoanthraquinone-3-sulfonic acid
Hexafluorobutadiene
2,5-Diethylbenzoic acid
1,3-Dimercaptobenzene
n-Octacosanol
Cuminoin
Monothiocatechol
Dithiocatechol
1-Hydroxy-2-anthramine
1-Hydroxyacridine
1-Nitroacridine
1,6-Dihydroxynaphthalene
3,3'-Diiodo-4,4'-diaminodiphenyl methane
1,3,5-Hexatriene
n-Triacontanol
2-Hydroxybenzothiazole
2-Nitrosophenol
2-tert.-Butyl-4-methoxyphenol
1,4-Dimercaptobenzene
2,2-Difluoroheptane
Benzyl dodecyl dimethyl phosphonium chloride
3-tert.-Butyl-4-methoxyphenol
Benzyl trimethyl ammonium butoxide
Benzylimidodi-(4-methoxyphenyl)methane
Cadinene
3-Hydroxyanthranilic acid
3,4,5-Trihydroxyanisole
Tri-(p-isocyanatophenyl) methane
2,5-Dimethyl-2,4-hexadiene
4-Chloro-o-toluidine

Leak Detector



Setting up the G-E Type H leak detector to test for leaks in thirteen miles of copper tubing. This detector will discover leaks which pass only 1/100 ounce of material per year.

Hydrocarbon Samples

The National Bureau of Standards and the American Petroleum Institute, through a cooperative program begun in 1943, have prepared a total of 162 compounds now available as NBS standard samples of hydrocarbons for calibrating analytical instruments and apparatus in the research, development, and analytical laboratories of the petroleum, rubber, chemical, and allied industries. The most recent additions to the series of compounds have been announced by the Bureau.

Instructions for transferring standard samples of hydrocarbons "in vacuum" are available on request. A complete list of NBS standard samples of hydrocarbons together with instructions for ordering, may also be obtained from the National Bureau of Standards, Washington 25, D. C.

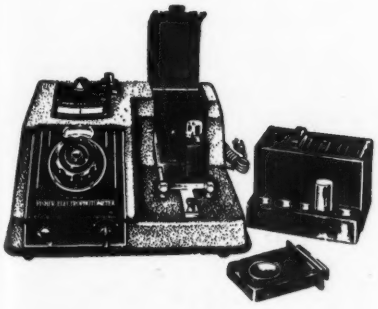
NBS Sample Number[a]	*Compound*		*Amount of Impurity*[b]	*Volume per unit*[c]	*Price per unit*
	Formula	*Name*			
			Mole Percent	*ml (liquid)*	
568-5S.....	$C_{16}H_{34}$	n-Hexadecane	0.06±0.04	5	$35.00
528-5S.....	C_6H_{12}	cis-3-Hexene	0.13±0.08	5	35.00
569-5S.....	C_5H_8	1, 2-Pentadiene	(0.34±0.15[d]	5	35.00
570-5S.....	C_6H_{10}	2, 3-Dimethyl-1, 3-butadiene	(0.06±0.03[d]	5	35.00
571-5S.....	$C_{10}H_{14}$	1-Methyl-4-isopropylbenzene	0.05±0.03	5	35.00
572-5S.....	$C_{11}H_{16}$	1-Methyl-tert-butylbenzene	0.08±0.05	5	35.00

[a] The designation "-5S" following the sample number indicates a sample of 5 ml sealed "in vacuum" in a special Pyrex glass ampoule with internal "break-off" tip.
[b] The purity has been evaluated from measurements of freezing points, as described in J. Research Natl. Bur. Standards *35*, 355 (1945) RP1676 unless otherwise indicated.
[c] Tolerance approximately ± 10 percent.
[d] When sealed Polymer formed may be removed as residue by simple vaporization of the sample "in vacuum" at an appropriate temperature.

Simple
Rapid
Accurate

STANDARD INSTRUMENT for COLORIMETRIC ANALYSIS

Fisher ELECTROPHOTOMETER



Fisher Electrophotometer, complete with built-in galvanometer, three standard filters, three 23-ml. absorption cells, manual containing typical procedures and step-by-step directions, for use with 110 volts, 50-60 cycle A.C. only, **$210.00**

The Fisher Electrophotometer permits colorimetric analyses to be made accurately, quickly and simply wherever the color of the solution varies in a definite manner with the concentration of a constituent. Because of its unique, valuable features, the Electrophotometer is now widely employed for conducting many essential routine analyses and for research.

The Electrophotometer operates from any 110 volt, 50-60 cycle line. With it, the user can detect very slight color intensity differences because the photoelectric system it employs is considerably more sensitive and reliable than the human eye. Once a calibration is made, subsequent analyses can be conducted as rapidly as the simple operations can be performed.

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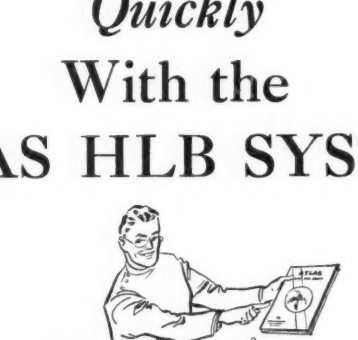
Choose the RIGHT Emulsifiers *Quickly* With the ATLAS HLB SYSTEM

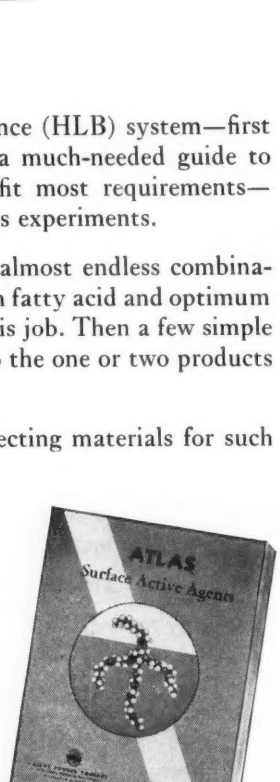


The new Atlas Hydrophile-Lipophile Balance (HLB) system—first of its kind—gives the industrial chemist a much-needed guide to choice of ideal surface active agents to fit most requirements—often saving hours or even weeks of tedious experiments.

Instead of trying dozens of emulsifiers in almost endless combinations, he systematically selects the optimum fatty acid and optimum HLB number of surface active agents for his job. Then a few simple tests frequently narrow the choice down to the one or two products best suited to this particular problem.

The HLB system "works wonders" in selecting materials for such purposes as:

ANTI-FOAMING — DETERGENCY
ALCOHOL REPLACEMENT — DEMULSIFICATION
EMULSIONS OF OILS, WAXES AND SOLVENTS
INSECTICIDAL SPRAY OILS AND CONCENTRATES
SOLUBILIZING — SPREADING
and many other related uses.



To find out how HLB can help *YOU*, write today *on your official stationery* for the Atlas Surface Active Agents book.

ATLAS CHEMMUNIQUÉ

Tween 80 Repels Macaroons!*

What to do when hundreds of macaroons stick to the paper on which they travel through the oven? They break if the paper is not wetted, but water-soaking takes 4 to 5 minutes to loosen them. Bakers solve the problem by using a 1% solution of Tween 80 emulsifier as a wetting agent. The little cakes drop off *right now!*

Real News for Lacquer Formulators

Lacquers showing an exceptional combination of sanding and cold-check properties are a 1949 development from a new series of oil-modified sorbitol hard gums. Atlas synthesizes sorbitol (hexahydric alcohol) on a large scale from natural sugars.

Emulsifiers Work Backwards, Too!

Emulsifiers can "break" emulsions as well as make them—and that's exactly what some manufacturers want. For breaking an O/W emulsion, use a W/O emulsifier (one with low HLB). And vice versa. The principle is discussed in the book, "Atlas Surface Active Agents."

*Reg. U. S. Pat. Off.

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Chemicals

Tall Oil.....B751
A bibliography with abstracts on tall oil in the soap, detergent, sulfonating, emulsifying and related industries. 20 pp., Bulletin No. 8, National Southern Products Corp.

Fatty Acid Esters.....B752
Data sheets giving specifications and respective solubility in oils solvents and waxes of polyethylene glycol mono and di stearates, laurates and oleates and various glycerol and glycol esters of fatty acids. W. C. Hardesty Co.

Substituted 1, 5-Pentanediols.....B753
Physical properties and industrial applications of substituted 1, 5-pentanediols. 2 pp., Carbide and Carbon Chemicals Corp.

Pigments and Extenders.....B754
Product and price data on pigments and extenders manufactured by C. K. Williams & Co.

Resins, Synthetic.....B755
Charts listing available Hercules Powder Co. synthetic resins and their properties. Trade names and test data included.

Triethyl Phosphate.....B756
4-p. bulletin describing specifications, properties, and uses of this chemical. Tennessee. Eastman Corp.

Formaldehyde, Flake.....B757
4-p. bulletin gives physical properties, specifications, and suggested uses for flake formaldehyde (paraformaldehyde). Bulletin N-16-1, Celanese Corp. of America.

Protective Coating.....B758
Pamphlet describing use of Spraylat temporary, strippable plastic coating. Spraylat Corp.

Pigments, Carbon Black.....B759
16-p. booklet describing carbon black pigments for the paint, ink, plastics and paper industries. Packing information, electrical properties and testing procedures included. Special blacks Div., Godfrey L. Cabot, Inc.

Lubricants, Lead Base.....B760
20-p. booklet on the services, facilities, and processing methods of the Brooks Oil Co.

Oil, Lubricants and Leather Packings..B761
4-p. booklet describing hydraulic oils, lubricants and leather packings used by plastic molders. E. F. Houghton & Co.

Salt.....B762*
56-p. booklet discusses in detail specific selected areas where salt and brines are available in quantity. Maps and diagrams included. Baltimore and Ohio Railroad Co.

Betaine Hydrochloride.....B763
Bulletin 1-6-49, 2 pp., gives description, uses, advantages and price of betaine hydrochloride. B. L. Lemke & Co.

Polyvinyl Chloride.....B764
12-p. booklet noting the outstanding properties of 22 plasticized polyvinyl chloride formulations. Monsanto Chemical Co.

Bright Dipping.....B765
1-p. bulletin describes advantages of Rossaul copper-brite for bright dipping of metals. Rossaul Co.

Solvents.....B766
4-p. bulletin describes physical and solvent properties of solvents manufactured by Celanese Corp. of America.

Finish, Textile.....B767
Booklet describes advantages and use of Permel water-repellent finish. Textile Finishing Bulletin No. 120, 7 pp., American Cyanamid Co.

Equipment

Speed Changer.....J423
1-p. bulletin describing adjustable-speed drive, operating principle, applications and design features of miniature variable-ratio speed changer. Bulletin No. 99, Metron Instrument Co.

Mixers and Blenders.....J424
Engineering data sheet No. 300-275 describes line of North-Erie mixing and blending equipment. H. W. North Co.

Generators.....J425
Bulletins Nos. 3149 and 21749 describing A. C. generators in capacities of 5 KW to 175 KW and 150 KW to 300 KW. Weights and dimensions included. Kato Engineering Co.

Process Industries Equipment.....J426
16-p. "Buying Guide" describes Allis-Chalmers products. Bulletin No. 149-164.

Calculating Machines.....J427
Description of engineering computing service for calculating load and stresses, determining closure and area, working simultaneous equations and other problems. Telecomputing Corp.

Metal Fabrication.....J428
"Men, Facilities and 'Know-How'," a 24-p. booklet describing L. O. Koven & Brother, Inc. Bulletin No. 490.

Fiberglas Insulation.....J429
Description of thermal and acoustical uses of Fiberglas Aerocor, blanket-like material made of glass fibers. 8 pp., Owens-Corning Fiberglas Corp.

Water Treatment.....J430
"The Accelator, the Modern, Proven, High-Rate Water Treating Plant," a 28-p. booklet on the principle, design considerations, operation, and applications of the Accelator process. Infilco, Inc.

Oilers.....J431
8-p. bulletin describes Gits visual oilers. Information on capacity, thread, dimensions and prices included. Gits Bros. Mfg. Co.

Vibration Control.....J432
Cork and rubber mounting which requires no bolting or cementing, for controlling transmission of vibration and noise is described in Bulletin ER-701, 4 p., Korfund Co.

Pipe Gage.....J433
2-p. bulletin gives data on operation and dimensions of 3-point pipe gage. Three Point Industries.

Control Instruments.....J434
Bulletin AC-1 describes AC and DC measuring, indicating, signalling and recording instruments. Prices and specifications included. Wheelco Instruments Co.

Wires and Cables.....J435
"NEasbestus" asbestos or asbestos and varnished-cambric insulated wires and cables are described in Catalog 509, 34 pp. National Electric Products Corp.

Panel Instruments.....J436
Information on the General Electric Co.'s improved line of 2½-inch panel instruments is given in Bulletin GEC-368A.

Flame Failure Safeguard.....J437
Bulletin CA496 describes Fireye photoelectric flame failure safeguard. Combustion Control Corp

Motors, Gear.....J438
12-p. Book No. 1815A describes gear motors. Selection table and minimum sprocket wheel diameters included. Link-Belt Co.

Pressure Regulators.....J439
Booklet 1044 describes complete line of Crawford pressure regulators. Construction and application details and tabular specifications, prices and weights included. Pittsburgh Equitable Meter Div., Rockwell Mfg. Co.

Alloy Steels.....J440
"Alloy Steels for Ball Mill Liners and Grates" recommends the alloy steel or iron best suited to meet different impact and abrasion combinations. 12 pp., American Manganese Steel Div., American Brake Shoe Co.

Welded Assemblies.....J441
4-p. folder on the advantages of factory unit-fabrication of welded piping headers, assemblies and valve grouping into one-piece units. Crane Co.

V-Belt.....J442
Bulletin V-1400-B18 gives specifications and selection charts for Vee-Ply V-belts. 6 pp., Worthington Pump and Machinery Corp.

Storage.....J443
"Protected Storage for Steel, Heavy Machinery and Equipment" lists services of Brooklyn Steel Warehouse Co. 10 pp.

Conveyor, Belt.....J444
4-p. folder describes portable power belt conveyor, and illustrates horizontal and inclined applications. The Rapids-Standard Co., Inc.

Filtering Equipment.....J445
Five bulletins describing Cellulo equipment, including filtermass, Lo-Ca asbestos pads, filter discs and pads, filter papers, filter presses and suction strainers. Specifications included. The Cellulo Co.

Photometers.....J446
4-p. descriptive circular No. 810, and 22-p. technical information bulletin No. 812 on exposure photometers for photomicrography and metallography. Complete information on procedure included. Photovolt Corp.

Classifier.....J447
Data on Dorr Type H classifier. Bulletin No. 2281, The Dorr Co.

Pumps, Rotary.....J448
"Facts About Rotary Pumps" titles booklet of the Blackmer Pump Co.

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Pumps, Centrifugal J449
Bulletin 1B49 describes 4 main types covering 26 basic series of self-priming centrifugal pumps. Specification table and selection chart included. 12 pp., Marlow Pumps.

Tachometer J450
Information on the General Electric Co.'s precision tachometer. Publication GEC-560.

Brake J451
Folder describes design features, ratings and dimensions of 2-shoe, 2-magnet d-c brake. General Electric Co.

Pumps, Centrifugal J452
"Handbook For Care of Centrifugal Pumps" includes information on how to figure head and tables to help determine total friction loss. Bulletin 08X6256A, 16 pp., Allis-Chalmers Mfg. Co.

Motors, Electric J453
32-p. booklet on the basic theory, operation, characteristics and applications, and control of large induction motors. Electric Machinery Mfg. Co.

Hose J454
6-p. catalog section gives data on size, couplings and test pressures and weight of B. F. Goodrich Co.'s lines of industrial fire hose.

Caustic Diluter J455
8-p. booklet describes advantages and specifications of caustic diluter. Caustic dilution table included. Proportioneers, Inc.

Gauges J456
Bulletin No. G620 describes the Bristol Co.'s Series 500 absolute pressure gauge with data on principle of operation.

Control Devices J457
6-p. bulletin contains specifications and engineering data on equipment for industrial automatic control. Bulletin No. 103, Conoflow Corp.

Steel J458
"Steel Making in America," a 100-p. volume on the manufacture of steel in the U. S., from raw materials through finished steel products. United States Steel Corp.

Air Conditioning J459
12-p. booklet describes air conditioning systems for crane cabs operating in hot or contaminated atmospheres. Bulletin 1300, Dravo Corp.

Separators J460
2-p. bulletin describes and gives capacities for non-electric magnetic separators for automatic tramp iron removal. Dings Magnetic Separator Co.

Materials Handling J461
Lewis-Shepard Products, Inc.'s Bulletin No. 24 covers jacklift electric trucks for horizontal movement and master jackstackers for horizontal and vertical movement of materials on skids and pallets.

Electrical Equipment J462
12-p. catalog No. EL49-93 features automatic locking Midget Ever-Lok plugs, receptacles and cord connectors. Dimensionsl drawings included. Russell & Stoll Co., Inc.

Ovens J463
Booklet describes advantages of "precision"-Freas ovens. Manual No. 397NR, Precision Scientific Co.

Casters J464
4-p. bulletin gives complete information on The Bassick Co.'s new line of forged-steel precision-type heavy-duty casters in 5, 6, and 8 inch diameter wheel sizes.

Dust Control J465
Booklet describes method of overcoming dust nuisance in the handling of dry pigments in the manufacturing of paint. Description of Sherwin-Williams Co.'s installation included. American Wheelabrator & Equipment Co.

Valves J466
Comparison chart designed to assist in the selection of stainless steel valves. 4 pp., The Cooper Alloy Foundry Co.

Sampler J467
8-p. booklet describes the operating mechanism and typical installation arrangements for both wet and dry processes of an automatic sampler. Hardinge Co., Inc.

Air Heaters J468
6-p. bulletin describes direct fire air heaters and is illustrated with flow charts. Application and operating data included. Bulletin No. 600, Peabody Engineering Corp.

Welder J469
2-p. bulletin gives information on portable spot welder. Greyhound A. C. Arc Welder Corp.

Brazing J470
Description of method for brazing copper with silver brazing alloy. 4 pp., Handy & Harman.

Car Shakeout J471
Bulletin No. 130 describes the Model GS car shakeout, designed to unload hopper-bottom cars. 4 pp., Robins Conveyors Div., Hewitt-Robins, Inc.

Power Driver J472
4-p. bulletin on how velocity-power driver drives steel studs into steel, masonry or concrete. Specification chart included. Bulletin No. TA-17, Mine Safety Appliances Co.

Compressors J473
8-p. booklet gives capacity, operation and construction of axial flow compressors for electric, steam or gas turbine drive. Clark Bros. Co., Inc.

Timers J474
Bulletin 504 describes special offerings of stopwatches, chronographs, interval timers, circuit control timers and tachometers. 4 pp., Andrew Technical Service.

Lift Truck J475
2-p. bulletin gives operating data and specifications for Model F-50 fork lift truck. The Buda Co.

Rotary Equipment J476
Descriptions and applications of rotary air motors, air compressors and vacuum pumps. 12 pp., Gast Mfg. Corp.

Water Purity Indicator J477
6-p. bulletin, 11-23-48 RCU, discusses problems encountered with steam and water purity. Typical test apparatus and equipment available listed. E. F. Drew & Co.

Cathodic Protection J478
Descriptive folder on the National Carbon Co.'s ground anodes and backfill material for cathodic protection and electrical grounding. Sizes, grades and application data included. Catalog Section M-8500A

Rectifiers J479
2-p. bulletin describes industrial power rectifiers. Clark Electronic Laboratories.

Valves J480
4-p. bulletin describes features and gives specifications for MacBain valves. Catalog No. 50, Tork Master Co., Inc.

Ladders J481
4-p. bulletin describes various all-steel step ladders from 1 to 6 steps. The Ballymore Co.

Valves J482
Bulletin 493 gives technical data, features and applications of solenoid valves. 4 pp., Skinner Electric Valve Div., The Skinner Chuck Co.

Petroleum Testing J483
104-p. book on advanced test apparatus for asphalt, gas, gasoline, grease and lubricants. List of petroleum testing utilities included. Catalog No. 705NR, Precision Scientific Co.

Furnaces, Laboratory J484
Bulletin Nos. 515 and 315 describe a high temperature electric furnace and box and muffle furnaces. Burrell Technical Supply Co.

Conveyors J485
Bulletins LC-1 and SBT-1 give all specifications for lateral curve and belt type conveyors for bottles, jars, cans and containers. Island Equipment Corp.

Anchor-Guide J486
4-p. booklet gives advantages and specifications of anchor-guide for expansion joints. Piping Specialties, Inc.

Oil Burners J487
Catalog No. 409 gives capacities and dimensions for oil burners and accessories. 8 pp., Hauck Mfg. Co.

Materials Handling J488
Bulletin 4881 lists various materials handling equipments which supplement the basic line of the Barrett-Cravens Co. 4 pp.

Welding J489
"Repairing Gray Iron Castings by Welding," an 8-p. reprint covering the repair and maintenance by welding of cast parts. Air Reduction Sales Co.

Steam Cleaning J490
Booklet on applications of steam cleaning, chemical requirements, a good steam cleaning compound, and instruction chart on maintenance of steam cleaning equipment. Du Bois Co.

Steel Heat Treating J491
"Shop Notes on Heat Treating of Steels" discusses typical heat treating procedures. Definitions of heat treating terms also given. Cooley Electric Mfg. Co.

Blowers and Exhausters J492
4-p. booklet gives capacities and specifications of centrifugal type blowers and exhausters. Allen Billmyre Div., Lamson Corp.

Coating and Handling Equipment J493*
24-p. booklet describes in detail units and systems for handling and processing textiles, papers, films and foils. Descriptions of various types of letoffs, coaters, dipping machines, drive rolls, oven units and tensioning devices included. Industrial Ovens, Inc.

pH Instrumentation J494
Bulletin No. 430, 16 pp., describes equipment for the measurement and control of pH in industrial processing operations. The Foxboro Co.

Meters J495
Bulletins Nos. 400-F1 and 400-F2 describe meters for steam, air or gas. Data on operation, capacities, installation and specifications included. Builders-Providence, Inc.

Compressors and Pumps J496
Bulletins H-620-B30 and C-1100-B34 give detailed descriptions and specifications of air-cooled compressors and dry vacuum pumps and of ammonia booster compressors. Worthington Pump and Machinery Corp.

Water Pre-Treatment J497
"Dorr Equipment and Methods for Modern Water Pre-Treatment" contains brief descriptions of equipment available from the Dorr Co. for water pre-treatment in municipal and industrial fields. 8 pp.

Thermocouples J49*
40-p. data book contains descriptions, prices and recommendations for thermocouples, heateyes, lead wire, heads and other devices, and information for thermocouple selection and application. Bulletin T/C 7, Wheelco Instruments Co.

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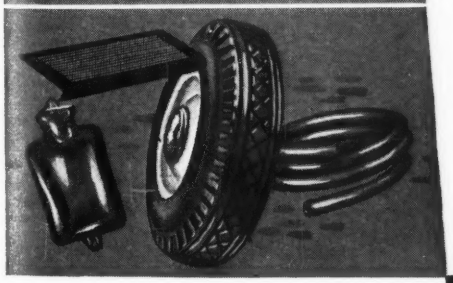

Both of the Sharples Diamylphenols are of interest as intermediates for organic synthesis.

The tertiary isomer can be used for resin manufacture, for lubricating oil additives and for rubber chemicals. It also finds application as a plasticizer and as an anti-skinning agent for surface coatings.

PROPERTIES:

	Di-tert-amylphenol	Di-sec-amylphenol
Color	lt. yellow to brown	clear amber
Physical State at Room Temperature	liquid	liquid
Specific Gravity	0.93-0.94 @ 30°C.	0.91-0.93 @ 20°/20°C.
Distillation		
Initial Boiling Point	275°C. min.	— — —
Not less than 95% below	300°C.	— — —
95% between	— — —	280-305°C.
Final Boiling Point	310°C. max.	— — —

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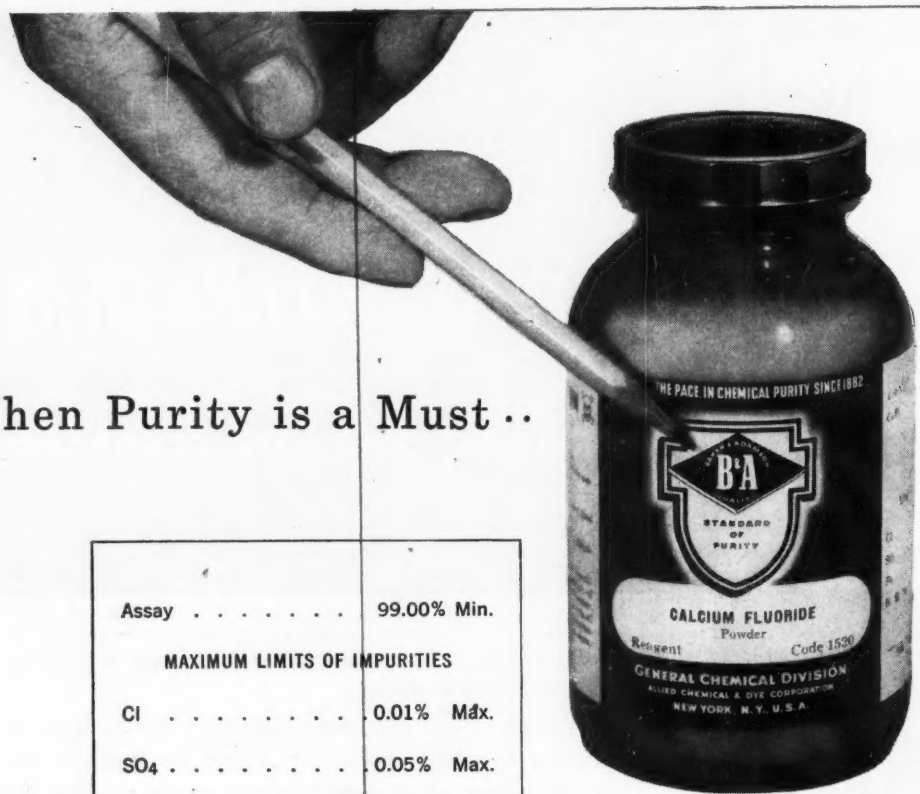

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NEWS OF THE MONTH

New Construction

American business, exclusive of agriculture, plans to spend $4.6 billion on new plant and equipment in the third quarter of this year, according to the quarterly survey of actual and prospective outlays conducted jointly by the U. S. Department of Commerce and the Securities and Exchange Commission.

This anticipated expenditure represents a decline of about 4 per cent from the preceding quarter and is about the same amount below the corresponding quarter of 1948.

Phillips Chemical Co. is doubling production capacity of its Cactus anhydrous ammonia plant near Etter, Tex. The ammonia plant will have a capacity of over 140,000 tons a year compared with the previous capacity of 70,000 tons. The additional facilities are expected to be ready for operation within the next two months. The Cactus plant supplies anhydrous ammonia to Phillips' ammonium sulfate fertilizer manufacturing plant at Port Adams near Houston, Tex.

Other facilities are being installed adjacent to the ammonia plant for the production of nitric acid to be used in making ammonium nitrate fertilizer. This plant is expected to be in operation by the latter part of 1949 and will have a production capacity of approximately 100,000 tons of solid ammonium nitrate a year.

Substantially all of the company's production of anhydrous ammonia and ammonium sulfate is now available for commercial sale.

The Dow Chemical Co., Midland, Mich., plans to start the large-scale production of DL-Methionine this fall in a new plant at Pittsburg, Calif. The plant is the first large unit constructed to produce this amino acid synthetically. DL-Methionine promises to play an important role in supplementing the plant proteins of nature which are low in this essential amino acid. Most work to date has been done in the poultry field where results of methionine-supplemented diets have been most encouraging.

Stacey-Dresser Engineering, Cleveland, Ohio, is building a Desulfo unit for the Hoosier Gas Corporation in Vincennes, Ind. It will be in operation in September and will process up to 3,000,000 cubic feet of gas per day, reducing the hydrogen sulphide content of the gas to one grain per 100 cubic feet.

Glenn McCarthy (left) shakes hands with plant manager Hugh Neal as J. E. Bludworth, process developer, watches first tank car of chemicals move from McCarthy Chemical Co. at Winnie, Tex., where acetaldehyde, methanol and formaldehyde are made from natural gas.

Refined Syrups & Sugars, Inc., has placed an issue of $2 million in fifteen-year sinking fund notes with the Metropolitan Life Insurance Co. Proceeds of this borrowing will be used principally in connection with the company's substantial plant improvement program.

An expansion program which increased production of kraft paper from 200 to more than 350 tons daily is nearing completion for the Gulf States Paper Corp., Tuscaloosa, Ala., by the H. K. Ferguson Co.

The Institute of Gas Technology is constructing a new $600,000 building in Chicago to house its rapidly expanding facilities for gas industry research and education. The building will house precision laboratories, some research laboratories, educational facilities, information service, library and administrative and business offices.

A $120,000 gift to the Philadelphia Textile Institute Foundation has been made by the Scholler Foundation, Philadelphia. Eighty thousand dollars of this gift will be used to build and to equip the entire Dye Laboratory of the new Philadelphia Textile Institute in Germantown. The remainder will be used towards the $150,000 still needed for the purchase of scientific instruments and additional modern machinery.

A gift of $1 million from Alfred P. Sloan, Jr., chairman of the board of the General Motors Corp., has been received by the Massachusetts Institute of Technology for construction of a Metal Processing Laboratory building, which will be named for the donor.

Government Contracts

Recent army contract awards include the following: ammonium sulfate, 10,000 tons ($272,000), to The Best Fertilizers Co., Oakland, Cal.; ammonium sulfate, 20,000 tons ($526,400), to The Best Fertilizers Co., Oakland, Cal.; fire extinguishers, 8,000 ($192,400), to Walter Kidde, Belleville, N. J.; fire extinguishers ($221,945), to Badger Fire Extinguisher Co., Somerville, Mass., and P_2O_5 ($1,949,954), to International Ore & Fertilizer, N. Y. C.

The Munitions Board is establishing a Military Procurement Information Center to provide guidance to businessmen seeking contracts with the Army, Navy, and Air Force. The central office will be staffed by procurement specialists from the three services, who will have on hand or will be able to obtain for a businessman on short notice information as to which service is buying what, and where.

The U. S. Atomic Energy Commission has obtained the services of the Western Electric Co. and the Bell Telephone Laboratories for the operation of the Sandia Laboratory at Sandia Base, Albuquerque, N. M. The new operator of the laboratory, will have an important function in bridging the gap between laboratory development work and the

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manufacturing operations on atomic weapons.

Charles W. Frost (left), formerly vice-president of Prior Chemical Corp., who has joined the industrial chemical sales division of Mathieson Chemical Corp., and William W. A. Johnson, elected treasurer of Skinner & Sherman, Inc., Boston analytical chemists and bacteriologists, on the occasion of the purchase of its outstanding stock by the New England Spectrochemical Laboratories, Ipswich, Mass.

Foreign Developments

Norway has a new 150-ton-a-day ammonia (liquid) plant in Norsk Hydro's recently completed unit at Glomfjord, north of the Arctic Circle. Liquid ammonia from the new plant will be transported to Norsk Hydro's Heröya complex via three new specially constructed tankers and there processed into a variety of chemicals. Installations at Glomfjord include a 72,000 KW rectifier unit (the largest in Europe), two electrolytic chambers each over 1120 by 320 feet, two new generators, and a water system capable of delivering 250 gallons per second.

The alarming rate at which Japanese toys made of flammable celluloid are being imported into the United States has caused concern among American plastics manufacturers who fear that these dangerous items may bring unwarranted criticism upon non-flammable American plastic toys, as well as cut into their market. The imports, said to be inferior, are produced by such low-cost labor that despite import duties, they can undersell the products of highly paid U. S. labor. Manufacturers have spoken in favor of reasonable legislation to regulate these flammable toys.

Company Notes

Rogers Corp. and Bakelite Corp. have terminated their toll agreement under which Rogers, which has plants in Goodyear and Manchester, Conn., had manufactured a group of high strength thermosetting phenolic materials for Bakelite.

The Schering Corp.'s long-pending suit against the Glidden Co. for alleged infringement of progesterone patents will be settled out of court. According to terms of the agreement, Glidden's progesterone customers will be granted a license under these patents by Schering under fair terms. Glidden will be authorized to manufacture progesterone as in the past and the company's customers will have no past liability to Schering because of their progesterone activities.

Harford County Distillery, Havre de Grace, Md., which for the past 60 years has manufactured the Lansdowne whisky, is up for sale in its entirety, complete with all equipment and grounds through the Chemical and Process Machinery Corp., New York.

Virginia-Carolina Chemical Corp. has moved the administrative offices of its Fiber Division from the V-C Fiber Plant at Taftville, Conn., to its general offices at Richmond, Va., where the administrative offices of all other divisions are located. The sales offices of the Fiber Division will remain temporarily at Taftville, and subsequently also will be moved to Richmond. The research laboratory has been moved to the central research laboratories at Richmond.

The Taftville operations will continue primarily production, and with sales and service laboratories also located here.

CALENDAR *of* EVENTS

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., Oct. 13-15.

AMERICAN CHEMICAL SOCIETY, 116th national meeting, Atlantic City, N. J., Sept. 18-23.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, regional meeting, Mount Royal Hotel, Montreal, Quebec, Sept. 6-9.

AMERICAN OIL CHEMISTS SOCIETY, fall meeting, Edgewater Beach Hotel, Chicago, Oct. 31-Nov. 2.

AMERICAN SOCIETY FOR TESTING MATERIALS, 1st Pacific Area National Meeting, Hotel Fairmount, San Francisco, Oct. 10-14.

ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, annual meeting, Sheraton Hotel, New York City, Oct. 25.

DRUG, CHEMICAL AND ALLIED TRADES SECTION, N. Y. BOARD OF TRADE, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa., Sept. 22-25.

ELECTROCHEMICAL SOCIETY, semiannual meeting, La Salle Hotel, Chicago, Oct. 12-15.

EXPOSITION OF CHEMICAL INDUSTRIES, Grand Central Palace, New York City, Nov. 28-Dec. 3.

FEDERATION OF PAINT AND VARNISH PRODUCTION CLUBS, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., Nov. 3-5.

INSTRUMENT SOCIETY OF AMERICA, convention, Municipal Auditorium, St. Louis, Mo., Sept. 12-16.

NATIONAL PAINT, VARNISH AND LACQUER ASSOCIATION, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., Oct. 31-Nov. 1.

PACIFIC CHEMICAL EXPOSITION, San Francisco, Nov. 1-5.

SCIENTIFIC APPARATUS MAKERS ASSOCIATION, mid-year meeting, laboratory apparatus section, Broadmoor Hotel, Colorado Springs, Colo., Sept. 28-30.

TANNERS COUNCIL OF AMERICA, leather show, Waldorf-Astoria, New York City, Sept. 7-8.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, fall meeting, Multnomah Hotel, Portland, Ore., Sept. 11-15.

WATER AND SEWAGE WORKS MANUFACTURERS ASSOCIATION, New England Water Works Association convention, Hotel Statler, New York City, Sept. 14-17.

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PERSONNEL

Company Officers

• James G. Flanagan has been elected a vice-president and Kenneth A. Lawder elected treasurer of **S. B. Penick & Co.** Mr. Flanagan is also general counsel and a director of the company and has been secretary since 1942.

• Barclay E. Mackinnon has been elected a vice-president of **The New York Quinine & Chemical Works, Inc.** He has served in various capacities with the company since 1933 when he joined its sales department.

• **The Edwal Laboratories, Inc.** has elected two new directors to its organization. They are Carl S. Miner, director of Miner Laboratories, Chicago, and Harold White, Jr., partner in White-Weld and Co., New York.

• Horace A. Gage, formerly assistant vice-president in charge of sales for Wyandotte Chemical Corp., has joined the **Cecil H. Jarrett Co.** of Newton, North Carolina, as general manager and treasurer.

• **Arenol Chemical Corp.** has elected Leo K. Rochen president and Seymour Blau to be vice-president. Dr. Rochen goes to Arenol's plant from Keto Chemical Co. where he served as chief chemist for several years. Mr. Blau also was with the latter firm.

Production

• **Maneely Chemical Co.** has appointed Morgan Jones as superintendent of its plant at Wheatland, Pa. He goes to Maneely directly from the Calco Chemical Div. of American Cyanamid Co. at Marietta, Ohio.

Max A. Minnig (left), appointed sales manager of the Carbon Black Division of Witco Chemical Co., and Spencer W. Pitts, elected secretary of the J. M. Huber Corp. Mr. Minnig will continue as vice-president and director of Witco Carbon Co., and Mr. Pitts will continue as assistant to the president of Huber.

• Irving Cantor, chemical engineer and group leader of **Foster D. Snell, Inc.**, has been assigned to Aruba in the Netherlands West Indies. Mr. Cantor is engaged in the construction and supervision of operations of a new pharmaceutical plant.

• Dominic F. Cannon has been appointed superintendent of **Pittsburgh Plate Glass Co.'s** Works No. 4 at Ford City, Pennsylvania. He succeeds W. G. Watson, who retired earlier this month after completing forty years' service in the glass division's manufacturing department.

Sales

• George S. Demme, assistant director of nylon sales for the last five years, has been made director of sales of the Acetate Division of the **Du Pont Co.'s** Rayon Department. He succeeds Robert E. Cullen, who will retire next month after more than 34 years with Du Pont.

• **Archer-Daniels-Midland Co.** has appointed Burton W. Schroeder as manager of fatty acid sales. Prior to his new appointment, he was in charge of the Industrial Cereal Products Division.

• Thornton C. Jesdale and Chester L. Jones have been named assistant general managers of sales for the Merrimac Division of **Monsanto Chemical Co.**

Research

• Joel Douglas Pelham has been appointed head of the Analytical Section, Physical Division, of **Southern Research Institute.** Formerly he was management analyst for Anniston Ordnance Depot, and asst. chief chemist for Du Pont.

• E. W. Riblett has been transferred from the New York office of **The M. W. Kellogg Co.** to Jersey City, N. J., as associate director of the Petroleum and Chemical Research Laboratory.

Associations

• William Burt Carter has been appointed assistant secretary of the **Manufacturing Chemists Association.** Mr. Carter has been associated with the chemical industry for the past fifteen years.

ISCOOPERATION News

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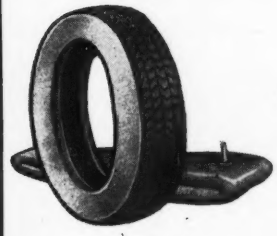

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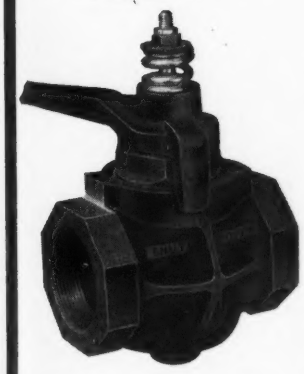

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CHEMICAL MARKETS

Paint Prices Dip with Linseed Oil

Paint manufacturers have cut prices amounts varying from 5 to 15 per cent, depending on the kind and quality of paint, in an adjustment to lower raw material prices — particularly for linseed oil — and an attempt to bolster sales. Pittsburgh Plate Glass Co., for example, has reduced its top quality house paints 87¢ (15%) to bring it in base areas to less than $5 a gallon. Varnishes and enamels that do not contain as high a proportion of linseed oil were reduced less.

With the government support price on flaxseed reduced from $6 to $3.99 a bushel, prices on the oil from this year's crop are expected to be no greater than 20¢ a pound in contrast to the 27.8¢ that held last year. Spot oil is now at 23.9¢, Minneapolis, and September futures are as low as 18¢.

Export Controls Lifted On Naval Stores Products

The Office of International Trade, U. S. Department of Commerce, has added several naval stores products to the list of commodities which may be shipped to any destination in the world without validated export licenses. The products affected by the action and their Schedule B Numbers (in parenthesis) are: gum rosin (211000); wood rosin, except B wood rosin (211100); gum spirits of turpentine (211400); wood turpentine (211510); other terpene hydrocarbons derived from naval stores (211610); pine oil, products and derivatives (211710); and tar and pitch of wood (except Vinol resin) (211800).

Market Review

Reduced operations and plant shutdowns for vacations, coupled with further efforts to work off inventories, brought a dull tone to summer markets. Conditions were generally steady or on the downward side, although non-ferrous metals showed some life and there were some corresponding advances in metallic derivatives.

Solvents went on the downward slide again after the raise that established the new alcohol price of 32¢ a gallon for the tax-free material. Ethyl acetate was reduced 1¢ a pound in what was believed to be a belated adjustment to the generally lower alcohol prices that have been established over the past few months. The 85-88% material is now 9¢ a pound in tankcars. A 1½¢ drop in butyl alcohol and butyl acetate established a price per pound of 12½¢ in tankcars, 14¢ for carlots, and 15¢ for less than carlots. Reductions were extended to secondary butyl acetate (reduced 1¢ a pound to 10¢); methyl ethyl ketone and isopropyl acetate (reduced 1¢ a pound to 9¢); methyl isobutyl ketone (off 1½¢ a pound to 11¢); and methyl amyl alcohol and acetate and methyl isobutyl carbinol (off 1½¢ a pound to 11½¢). (All prices for tankcars.) Dibutyl phthalate followed the butyls down in a 1¢ reduction to 29¢ a pound in tankcars.

With worry about the steel strike allayed temporarily at least, major interest in coal chemicals centered around several important price reductions. Crude naphthalene, reduced ¾¢ a pound to the tankcar price of 5¼¢ for the 74° and 5¾¢ for the 78° material, remained firm at this level. Phthalic anhydride was available at 21½¢ a pound after a 1 cent reduction. Under pressure from declining prices for imported acid, cresylic acid was slashed 25¢ a gallon to 80¢ for domestic high boiling and 85¢ for the low boiling. Cresol and ortho cresol were also reduced to 11¼¢ a pound (for the technical cresol) and 15¢ (for 25-27% ortho cresol), both in tankcars. As a result of this trend, the tricresyl phosphate tankcar price fell from 37¢ a pound to 34¢, and then further to 33½¢ and 33¢ for the coal and petroleum material respectively. British suppliers were said to be willing to shade offers of 65¢ a gallon for imported cresylic, c.i.f., New York, and conditions were unsettled.

Heavy chemicals felt the effects of the dry, hot weather in heavy demand for calcium chloride for dust laying on highways and for chlorine for water and sewage treatment. Synthetic ammonium sulfate producers adjusted prices downward to $51.50 a ton, f.o.b. plant in keeping with leveling off of anhydrous ammonia at about $75 a ton. Canadian ammonium nitrate was lowered $16.50 a ton to $63 f.o.b. Port Robinson, Ontario. Midwestern ammonium nitrate is about $59.

Early reductions in metallic soaps brought copper naphthenate, 8%, to 22¼¢ a pound and lead and zinc naphthenates to 21¢ and 20¾¢ respectively. The linoleates were also reduced. With the recovery of lead prices, pigments were advanced ¼¢ to ½¢ a pound.

Nothing startling occurred in fine chemicals, drugs or essential oils as most remained steady. Penicillin was reduced about 25% for some forms; theobromine was off 25¢ to $5 a pound; and natural peppermint oil was down 15¢ to $5.60 a pound. Among vegetable waxes, a moderate demand upped carnauba prices slightly, and the No. 1 sold for $1.10 a pound.

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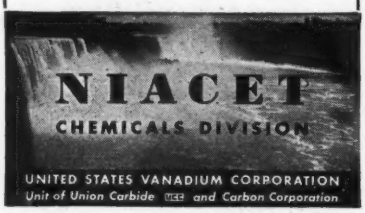

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Research Economics

(Continued from page 200)

level of sales. The unit profit margin has shrunken, of course, because labor productivity rose less than 10 per cent when wage rates more than doubled (Table I), and because prices did not go up as much as costs.

ABC is shown as meeting its tighter cash position in 1949 by cutting its dividends to three-quarters those of 1948. The market price of its stock is indicated as falling less than its earnings, so that the yield on its reduced dividends will remain unchanged at 6.2 per cent while its price-earnings ratio rises to 8.7. The cash available for all kinds of capital expenditures, however, will be cut in two. It will amount to only 70 per cent of its annual research expense compared with 140 per cent in 1948.

What change can ABC make in its research program in deference to this sharp reduction in its available cash?

The capital required for research of the defensive type is usually much less than that involved in the development of completely new products. A substantial portion of defensive research is service to production and to sales, where the bulk of the cost is payroll. Also, since the purpose is not so much to expand sales as to keep them from declining, the need for new plant and equipment is much less extensive. Hence, as one method of conserving capital, ABC can place increased emphasis upon such defensive measures as cost reduction, and more will be said on this subject at a later point.

Another method, which would apply to research of the aggressive type, would be to concentrate on the development of such new products as can be made in existing plant and equipment with a minimum of alteration. In either case, however, a ratio of only 70 cents of available capital to every dollar annually spent for research may turn out to be a little tight. In such an event ABC must either cut its research staff or resort to outside capital.

Nothing could be more futile than to starve a project with too little capital, however, and no type of research would suffer more in this respect than that which often has been so profitable in the past, namely the development of a whole new line of products without regard to the use of existing facilities. Suppose, for example, that ABC were to complete in 1949 a project which was begun eight years ago for such a purpose and which had the following history:

	Time to Complete	*Total Cost*
Research	5 years	$ 250,000
Development, including pilot plant	2	150,000
Total research and development	7	400,000
Plant and equipment	1	1,000,000
Working Capital	–	200,000
Total investment in project	8 years	$1,600,000

In the above tabulation the research and development expenditures are shown as an integral part of the company's total investment in the project. While such expenditures are treated as expense items in ordinary accounting practice, it is helpful in appraising the profitableness of the project as a whole to think of them as having been capitalized. In this concept they would be written off like fixed assets in some future period. And, as a matter of fact, if the income tax rates should be the same in that period as when the research actually was done, the two accounting procedures would lead to identical results.

The 1949 cash requirements of this project are the $1,200,000 needed for fixed assets and working capital. This is in excess of the $750,000 of cash available to ABC in 1949 for all purposes (Table IV), and additional capital must be raised. Incidentally, the total of $1,600,000 required by the project over its eight year life is divided three-quarters to capital account and one-quarter to research and development. The annual average is $150,000 for capital and $50,000 for research—a ratio of 3 to 1.

If ABC should finance this project by new common stock, the cost of such capital at the 1949 price-earnings ratio of 8.7 would be 19.2 per cent. Hence, so long as this ratio remains unchanged, the project must earn 19.2 per cent of $1,600,000, or $307,000 a year, to keep the stockholders from losing. The productive assets of the business are not $1,600,000, however, but only $1,200,000. Hence, in order to earn $307,000 on the business itself, the rate of return must be 25.6 per cent. And even at this high rate ABC's earnings per common share would not be increased, and its only gain would be a more diversified product structure.

The ratio of capital to research will vary widely, of course, from project to project and from company to company. Thus, the annual expenditures for research must include the cost not only of the successful projects but of the unsuccessful ones as well. This has the effect of lowering the ratio and of increasing the required return on the successful projects. For example, suppose ABC were spending an average of $350,000 a year, or one-third of its total research budget, for the development of new products. And, to use an extreme case, suppose also that the above project alone were successful and had to absorb a loss of $300,000 a year on all the other projects over the same eight-year period. Instead of being 3 to 1, ABC's ratio of capital to research would then drop to 0.43 to 1 (1,200,000/2,800,000). And the required rate of return on this one successful project would rise from 25.6 to (0.192 × 4,000,000)/1,200,000, or 64.0 per cent!

Contrariwise, the capital requirements

(*Turn to page 288*)

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Research Economics

(Continued from page 286)

of a successful project ordinarily do not stop with the first plant. Thus, ABC's $1,200,000 enterprise may subsequently be expanded tenfold to $12,000,000 without any further increase in the original $400,000 of research and development. The ratio of capital to research on this single project then becomes 30 to 1, and the necessary minimum rate of earnings would be $(0.192 \times 12{,}400{,}000)/12{,}000{,}000$. or only 19.8 per cent. In general, therefore, the more successful a company is in the development of new products, the greater will be the amount of new capital required per dollar of its research expenditures.

Unless activity of this type is itself curtailed, therefore, it would be futile for ABC to plan a research program involving a reduction in its dollar requirements for new plant and equipment in the future. But while new-product research cannot be made financially more attractive by the use of less capital, its economics can obviously be greatly improved by the use of cheaper capital. Thus, if the price-earnings ratio of the company's stock were to rise from 8.7 to 12.0, the $1,200,000 project would have to earn at a rate of 18.5 per cent and the $12,000,000 project at only 14.4 per cent to keep the stockholders from losing. Unfortunately, however, the management of ABC has little or no control over the market action of its stock. But if price-earnings ratios should fail to rise enough and if equity financing should not become cheap enough the company can continue for some time to resort to low-cost senior capital.

The situation in which ABC finds itself explains why so large a porportion of all new capital raised by industry since the war has been in the form of debt. The most recent comparable period of high-debt financing was in the middle twenties, at which time price-earnings ratios also were low. The reason for the low ratios then was probably unfamiliarity with industrial stocks as an investment medium rather than, as now, uncertainty over their outlook and the extremely high level of taxes. High personal taxes are unfavorable to common stocks and equity financing since both dividends and capital gains are subject to such taxes. High corporate taxes, while harmful to both equity and preferred stock financing, are favorable to debt financing since interest charges are deductible before such taxes.

The supply of loanable funds, furthermore, has more than kept pace with the increased demand. The factory worker and the farmer have been the chief beneficiaries of our postwar boom, and they do not ordinarily buy stocks. They do buy life insurance, however, and they have bought in such a quantity that the life insurance companies have been able to purchase nearly 7 billion dollars of industrial bonds since 1940. Thus, while our pool of low-cost equity capital has been drying up, a new source of debt capital has been in the making.

Question No. 3: Have research executives made due allowance, in the priority assigned to their various projects, for the changes which have occurred in the availability and relative cost of the various kinds of capital?

IT IS a business axiom that the method of financing should be tailored to fit the project to be financed. Long-term projects involving a maximum of risk are most soundly financed by retained earnings or common stock. Where the risk is only moderate but where permanent capital still is required, the use of preferred stock is indicated. Debt in any form must always be repaid, however, and is properly employed only where little doubt exists that all maturities can be promptly met when due.

A new company with only a few products should never depend on borrowed funds to finance its growth, but an established company with a broad base of time-tested earnings is in a different position. It can well make use of term loans or debentures to provide some of the capital needed to expand its business. The security behind such debt, however, is not the added business thus created but rather the earnings which previously existed. Hence, there is a limit to which a company can prudently resort to borrowed capital, and that limit will vary with its type of business. Few industrial companies have reached that limit today but some are approaching it.

Research projects, like capital, can also be divided into three groups: At one extreme the "bond" type of project presents only a small risk, pays off quite promptly, and is correspondingly limited in its earnings potential. At the other extreme, the "common stock" type of project is inherently far more hazardous and much more demanding of patience on the part of management, but has "jackpot" possibilities of profit. Somewhere between the two is the "preferred stock" type of project.

The psychology of many managements before the war favored the high-risk, high-return type of research. With retained earnings at their then low cost, this policy was not only sound but frequently quite profitable. In the present postwar period, however, the cost of retained earnings is sharply up, while the

(*Turn to page 290*)

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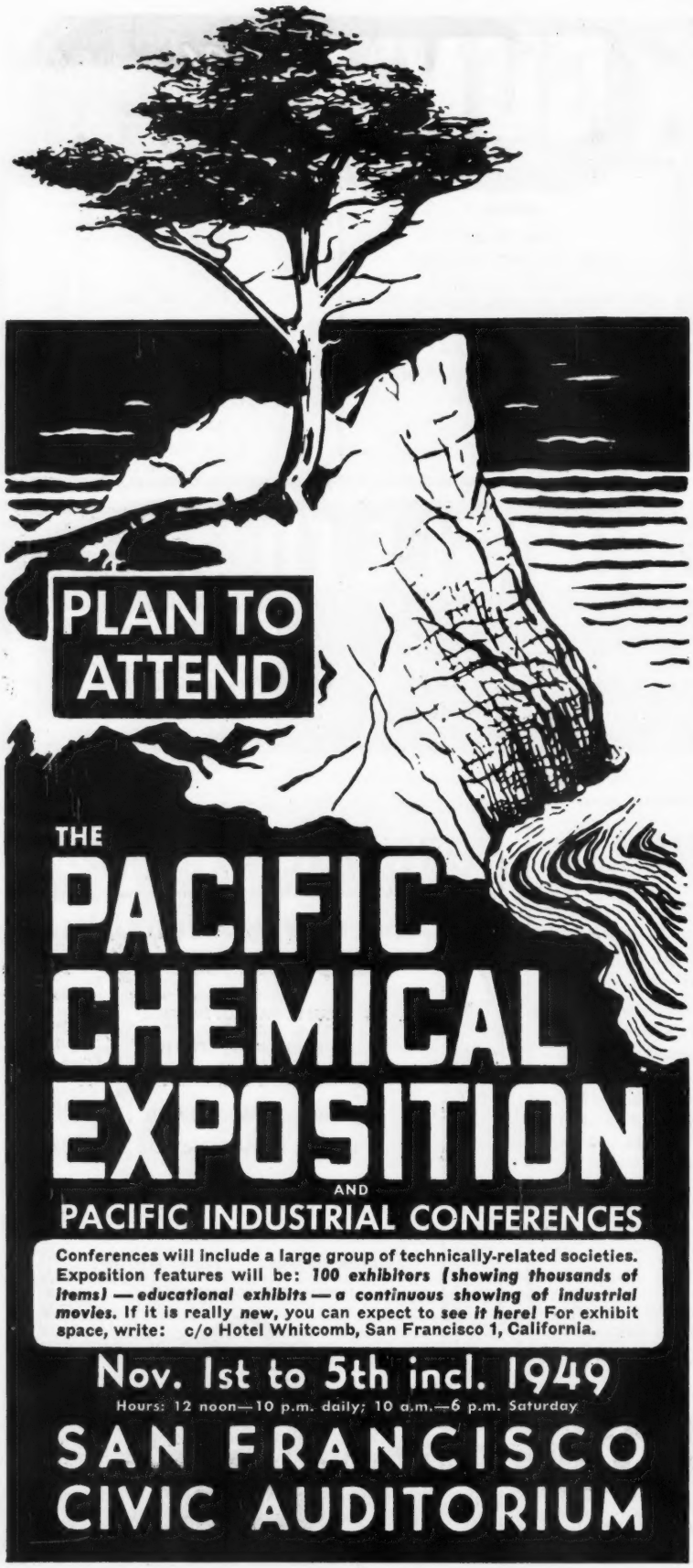
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Research Economics

(Continued from page 288)

cost of debt is down. Should research executives continue to give the same order of priority to their various types of projects as they did in the prewar years? Or should they put greater emphasis on that type of project which best fits the changed conditions of postwar financing?

The low-risk type of research would merit increased consideration even if it could not now be financed on so much more favorable terms than any other type. It is particularly well adapted to cutting costs, and a revitalized program of cost reduction is one of the greatest economic needs today. It is needed by industry as a whole because full employment requires increased production, increased production requires greater sales, and greater sales require lower costs. And it is needed in particular by every company that has suffered a shrinkage in its normal profit margin and is faced by the fear of pricing itself out of its market. Granted that labor productivity usually rises as employment declines, it can scarcely be expected to return automatically to its prewar level without some further assistance from management.

Cost-cutting research is usually low in risk because it involves a minimum of outright pioneering. It is often characterized by expanding the unit size of various items of equipment, by replacing batch by continuous processes, by increasing speeds and raising temperatures and pressures, by using better materials of construction and more efficient tools, by introducing more accurate instruments and methods of control, and in general by wasting less of this and saving more of that. The possible profit on each individual project may be small, but the number of such projects can well be great. Their total capital requirements are likely to be considered, moreover, and one of the most conspicuous of economic trends today is the steady rise in the investment required per factory worker. But if the cost-reducing program is soundly planned, it should be simple to finance. Depending upon the size of the program and the time required for the new equipment to pay for itself, the required funds may take the form of term loans (less than 10 years) from commercial banks or of long-term debentures either sold to the public or privately placed with insurance companies.

In conclusion, it should be emphasized that these new trends of an economic and financial nature are not proposed as factors which by themselves should control executive judgment. It should be emphasized just as strongly, however, that they are regarded as of sufficient importance so that they cannot safely be ignored by any company in the formulation of its research policy for the future.

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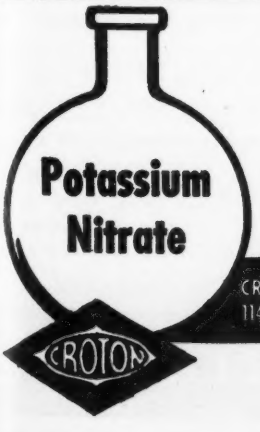

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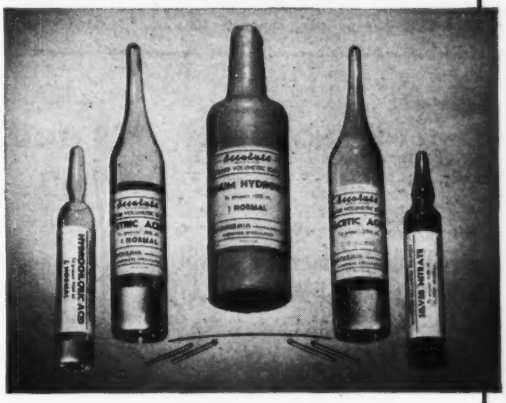

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Sulfur

(Continued from page 209)

MANY SMALL RECOVERY UNITS

There are many reasons why a great many small recovery plants are likely to be built in this country in the years to come. First, small (less than 50 tons daily recovery of sulfur) plants are economical to build and operate; second, there is a growing need to purify industrial gases, especially near large population centers; and third, the present price of natural gas makes it profitable to "sweeten" sour gas in certain fields by removing the sulfur content.

More importance has been attached to such projects, however, than is warranted by the facts. In 1947, only 43.4 thousand tons were recovered from natural gas as elemental sulfur in such units, and 20.6 thousand tons were recovered from refinery gas as sulfuric acid. Including all plants built or started since 1947, it is estimated that 220 thousand tons per year may be recovered by these processes, and it is not believed that within the next five years more than 500 thousand tons per year can be expected from all such operations.

FROM NATURAL GAS

All of the new plants are similar to those in Arkansas, where there are large volumes of sour natural gas close to market. In 1941, Texas Gulf Sulphur Co. and Southern Acid & Sulphur Co. built semi-commercial plants there, and the latter now operates two commercial units, one of 70- and the other of 110-short tons-per-day capacity. Texas Gulf recently joined with Pure Oil Co. to construct a plant at Worland, Wyoming, to handle 30 million cubic feet of sour gas containing 28 per cent hydrogen sulfide. This will be the largest plant of its kind when it has been completed.

In general, the hydrogen sulfide is stripped from the hydrocarbon gas by an amine solution (Girbotol process and others), and some modification of the Klaus process is used for recovery of elemental sulfur[8].

Only a few natural gases contain appreciable amounts of sulfur. To this extent the use of natural gas as a source of sulfur is distinctly limited, leaving only pyrites as the cheap and plentiful source for the future.

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(*Continued from page 236*)

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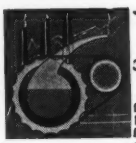

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Laundry Chemicals

(*Continued from page 226*)

is more of an art than a science since the degree of stiffness required in a given fabric is dictated solely by the customers' desires. Some laundries use a relatively large amount of starch, others use little or no starch. However, for starch, the industry spent $3 million dollars in 1948.

The principle laundry starches are thin-boiling wheat, corn, rice, and potato. Corn and wheat starch and their mixtures are most frequently used in the laundry.

The synthetic starches are relatively new-comers to the industry, and at the present time are more or less in the pilot plant stage in the evaluation of their adaptability to laundry use. Speaking roughly, they may be divided into two classes — permanent and non-permanent depending on whether the materials are of a substantive nature. The composition of these products can vary considerably. One of the non-permanent products is reported to be an emulsion containing sodium carboxymethylcellulose and paraffin wax.

The synthetic starches of a permanent type are not being used to any extent in the commercial laundry. The use of such materials, probably thermoplastic resins, would require careful segregation of the fabrics so processed in order to prevent overtreatment.

At the present time, quite a bit of research is being done toward the development of products other than starch designed to prevent or at least minimize soil penetration into a given fabric during its normal wear. These materials, such as polyvinyl alcohol, do not impart any degree of stiffness or water repellency to the fabric. It is expected that agents of this type will make the task of the laundryman a little easier when it comes time to wash these treated garments.

A few laundries include in their service, the treatment of various garments to impart water repellency. Most of the materials used for this purpose are proprietary wax emulsion mixtures.

MISCELLANEOUS CHEMICALS

Several chemicals either as such or in the form of proprietary compounds are used by the laundry for the removal of stains which may remain on the fabric after the normal laundering procedure. A partial list of such chemicals includes: ammonia, hyposulfites, magnesium sulfate, oleic acid, potassium or sodium permanganate, sodium bisulfite, sodium thiosulfate, titanium chloride or sulfate and various organic solvents.

TYPICAL LAUNDRY OPERATION

In laundering a given load of say 300 pounds of white fabrics of average soil content, the general washing formula in Table V may be considered as representative of the various steps in the operation as well as the relative amount of straight chemicals used.

On the average, about 3-5 gallons of water are used in the actual washing process per pound of fabrics laundered. In the overall picture, considering such things as boiler water and various other factors, it will require a total of about 6 gallons of water to completely process one pound of clothes.

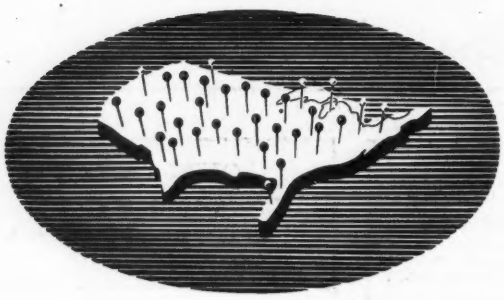
TABLE V—TYPICAL WHITE WORK LAUNDRY FORMULA

Operation	*Time Minutes*	*Temperature °F.*	*Supplies Used*
1. Suds	6	110	1-2 lbs. alkali 1 lb. soap or synthetic
2. Suds	6	125	10-12 oz. soap or synthetic 5-6 oz. alkali
3. Suds	6	140	3-5 oz. soap or synthetic 1 oz. alkali
4. Suds	10	155	6 qts. of 1% available chlorine bleach
5. Rinse	3	160	
6. Rinse	3	160	
7. Rinse	3	160	
8. Rinse	3	130	
9. Sour	5	100	5-10 oz. sour,
10. Blue	5	100	0.03-0.05 oz. blue

TABLE VI—EXPENDITURES BY LAUNDRY INDUSTRY FOR CHEMICALS IN 1948

Chemicals	*Millions of Dollars*
Soap (including synthetics) and alkaline builder	25.7
Bleaches, Sours, Blues	6.5
Starch or equivalent products	3.0
Water softening supplies	1.7
Water	6.9
Total	43.8

A bird's eye picture of the amount of money the laundry industry spent in 1948 for its chemicals may be seen from Table VI. This $37 million market for chemicals as such and for specialty compounds can be exploited by manufacturers alert to the laundry industry's requirements and changes in its technology.



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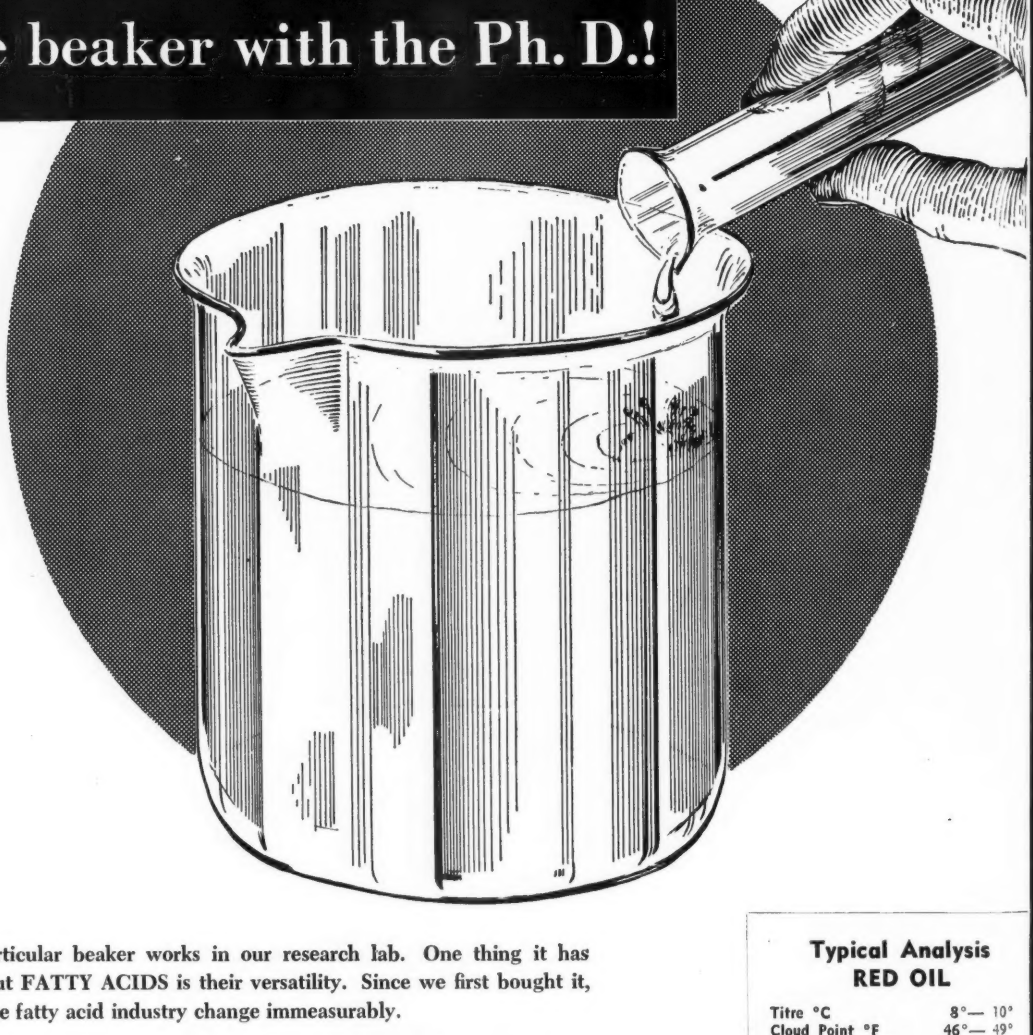

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U. S. Patents from Official Gazette—Vol. 621, Nos. 1, 2, 3, 4, (April 5-April 26)

Inorganic

Preparing a nicotine-heavy metal silicate by reacting a heavy metal silicate selected from the group consisting of copper silicate, zinc silicate, and mercuric silicate, with a member of the group consisting of free nicotine and nicotine sulfate. 2,466,157. Frederick E. Dearborn.

1-allyl-5-phenyl hydantoin and its corresponding alkali metal salts. 2,466,177. Loren M. Long (to Parke, Davis & Co.).

Process of adding fluorine to a double bond of an acyclic olefinic compound by mixing the olefinic compound and HF with PbO_2. 2,466,189. Teunis Phillip Waalkes (to E. I. du Pont de Nemours & Co.).

Reacting under alkaline conditions a lower alkyl ester of thioglycolic acid with a lower alkyl ester of 2-benzamido-3-chloro-propanoic acid to form an ester of 2-benzamido-3-carboxymethylmercapto-propanoic acid. 2,466,232. Stanton A. Harris and Dorothea Heyl (to Merck & Co., Inc.).

Manufacture of thiocarbamyl chlorides by contacting a tetraalkyl thiuram sulfide with chlorine. 2,466,276. Edmond J. Ritter (to Sharples Chemicals, Inc.).

Dehydrochlorinating a compound selected from the group consisting of high molecular weight chlorinated fatty acids and the alkyl esters thereof, comprising contacting with a solid dehydrochlorination catalyst selected from the group consisting of the elemental metals vanadium, chromium, iron, cobalt, and nickel. 2,466,340. George R. Van Atta and William C. Dietrich (to U.S.A. by the Secretary of Agriculture).

Producing an ester of an inorganic acid of phosphorous by blowing an unsaturated ester having the formula, $R\text{-}COOR_1$, wherein R represents the unsaturated hydrocarbon radical of oleic acid and R_1 represents a radical selected from the group consisting of β-ethoxyethyl and butyl and thereafter treating the blown ester with an acid of phosphorus. 2,466,393. Joseph B. Dickey and James G. McNally (to Eastman Kodak Co.).

Producing an ester of an acid of phosphorous by blowing an unsaturated ketone having the formula, $R\text{-}CO\text{-}R'$ wherein R is an unsaturated hydrocarbon chain of 3 to 25 carbon atoms in which the unsaturation is limited to olefinic unsaturation and R' is a hydrocarbon radical and thereafter treating the blown ketone with an acid of phosphorous. 2,466,394. Joseph B. Dickey and James G. McNally (to Eastman Kodak Co.).

6-membered heterocyclic compounds. 2,466,396. Joseph B. Dickey (to Eastman Kodak Co.).

Monoazo heterocyclic compounds. 2,466,397. Joseph B. Dickey (to Eastman Kodak Co.).

Preparing hydrocarbon-substituted halogenosilanes which comprises effecting reaction between a hydrocarbon halide, silicon, and a metalic catalyst. 2,466,413. William F. Gilliam and Robert N. Meals (to General Electric Co.).

Preparing hydrocarbon-substituted halogenosilanes which comprises effecting reaction between a hydrocarbon halide and the silicon component of a powder comprising. 2,466,413. William F. Gilliam and Robert N. Meals (to General Electric Co.).

β,β'-oxydipropionic acids. 2,466,419. Hugh J. Hagemeyer, Jr. (to Eastman Kodak Co.).

Increasing the rate of reaction between a hydrocarbon halide and silicon to produce a mixture of hydrocarbon-substituted halogenosilanes by simultaneously passing a mixture of a preformed halogen and the hydrocarbon halide over the heated silicon. 2,466,429. Dallas T. Hurd (to General Electric Co.).

Reaction product of a polyhydroxyl alcohol with a trivalent metal sulfate. 2,466,445. Milton Landau.

Preparing an ester of an alpha-beta unsaturated monocarboxylic acid by passing vapors of a mixture of a beta-lactone having a hydrogen atom on the alpha carbon atom and an alcohol in contact with an activated carbon catalyst. 2,466,501. Thomas R. Steadman and Charles E. Feazel (to B. F. Goodrich Co.).

Preparing pimelic acid esters by treating cyclohexanone (1)-carboxylic acid (2) esters with an alcohol containing less than 8 atoms of carbon in the presence of an alkaline reagent selected from the group consisting of alkali-alcoholate, caustic alkali and alkali carbonate. 2,466,588. Maximilien Grunfeld and Marc Edmond Batigne (to Societe Des Usines Chimiques Rhone-Poulenc).

Producing acetylene by passing a stream of preheated air to a reaction zone concurrently passing a stream of hydrocarbons to the reaction zone and homogeneously and instantaneously mixing the air and hydrocarbons by subdividing the hydrocarbon stream into a series of streamlets of small cross-section at the point of contact, the air being preheated to a temperature sufficiently high that upon admixture with the said hydrocarbons, the temperature of the resulting mixture is instantaneously raised to the reaction temperature, which favors the formation of acetylene. 2,466,617. Otto Spring (to Danciger Oil & Refining Co.).

Noncatalytic halogenation of certain alkylated acrylonitriles. 2,466,641. George W. Hearne, Donald S. LaFrance and Theodore W. Evans (to Shell Development Co.).

Reacting ketone with ketene in the presence of an acid selected from the group consisting of halosulfonic acids, oleum, alkylsulfuric acids and sulfamic acids. 2,466,655. Edward F. Degering (to Purdue Research Foundation.).

Preparing 3-chlorocouramin by passing Cl_2 gas into a CCl_4 solution of coumarin to produce a high yield of coumarin chloride, distilling off the CCl_4 and dehydrochlorinating the resulting oil by contacting it with a solution of NH_4OH in water. 2,466,657. James C. Heath, Samuel Z. Cardon and Harold S. Halbedel (to Harshaw Chemical Co.).

Purifying and separating N-[4-}-[(2-amino-4-hydroxy-6-pyrimido [4,5-b]-pyrazyl) methy 1]-amino}benzoyl] glutamic acid. 2,466,665. Coy W. Waller (to American Cyanamid Co.).

Amides of N-(2,3-dihydroxy-2-propenylidene)-aminobenzoic acid. 2,466,670. Robert B. Angier (to American Cyanamid Co.).

Acylated suberates and azelates. 2,466,678. Herman A. Bruson and Harry R. Raterink (to Rohm & Haas Co.).

2-acyl-2-(δ-cyanobutenyl)-cycloalkanones. 2,466,679. Herman A. Bruson and Thomas W. Riener (to Rohm & Haas Co.).

2-(β-carboxyethyl)-2-cyclohexenyl cyclohexanone. 2,466,680. Herman A. Bruson (to Rohm & Haas Co.).

1-chloro-2-acyl-1-cyclohexenes. 2,466,681. Herman A. Bruson and Harry R. Raterink (to Rohm & Haas Co.).

Separation of orthoxylene from isomeric xylenes by fractional distillation. 2,466,699. William L. Glowacki (to Koppers Co., Inc.).

Making a 1-acyloxy-1,3-diene by forming a mixture of an aldehyde having an aliphatic chain of not less than three carbon atoms attached to the carbonyl group, having an olefinic bond between the second and third carbon atoms and at least one hydrogen atom attached to the fourth carbon atom, and an acylating agent which is the carboxylic acid ester of the enol form of a ketone having a lower boiling point than the aldehyde in the presence of an esterification catalyst. 2,466,737. William M. Quattlebaum, Jr. and Charles A. Noffsinger (to Carbide and Carbon Chemicals Corp.).

Reaction of enol esters with anhydrides. 2,466,738. Benjamin Phillips, Jr. (to Carbide & Carbon Chemicals Corp.).

2-acyl-2-(β-cyanoethyl)-cycloalkanones. 2,466,739. Harry R. Raterink and Herman A. Bruson (to Rohm & Haas Co.).

Organometallic compounds containing 1,3,5-triazine rings. 2,466,764. Ernst A. H. Friedheim.

Improving the adsorption of carbon disulphide in a carbon disulphide-air mixture by lowering the moisture content prior to passage through an adsorbing zone. 2,466,871. Herman Leendert Van Nouhuys (to American Enka Corp.).

Pteridine compounds. 2,466,897. Martin E. Hultquist (to American Cyanamid Co.).

Making metallic naphthenates and soaps wherein the reaction is brought about in a molten mixture of the organic acid and the metallic compound by adding a preformed mixture of a basic nitrogen compound with a metallic compound capable of forming a Werner complex. 2,466,925. Oscar C. Brauner (to Darworth, Inc.).

2-acyl-2-(β-carbalkoxyethyl)-cycloalkanones. 2,466,926. Herman A. Bruson and Harry R. Raterink (to Rohm & Haas Co.).

Generation of synthesis gas in a geological formation. 2,466,945. Frank C. Greene (to In Situ Gases Inc.).

Manufacture of vinyl chloride from a mixture of acetylene and hydrochloric acid over a catalyst constituted by mercuric vanadate. 2,467,013. Alfred Jean Denis Henri Marie de Vaissiere (to Societe Anonyme des Manufactures des Glaces et Produits Chimiques de Saint-Gobain).

Nitro alkane sulfonyl chlorides. 2,467,028. Marvin H. Gold and Leonard J. Druker (to Visking Corp.).

Acylation with enol esters. 2,467,095. William M. Quattlebaum, Jr. and Charles A. Noffsinger (to Carbide and Carbon Chemicals Corp.).

Removing hydrogen halide from halogenated hydrocarbons by heating in the liquid state under anhydrous conditions the halogenated hydrocarbon with a catalytic amount of anhydrous ferric chloride. No. 2,467,123. Elmer E. Fleck and Herbert L. J. Haller (to U. S. A. by the Secretary of Agriculture).

Mono-alkyl esters of the addition product of levo-pimaric acid with maleic anhydride. No. 2,467,126. Morris M. Graff (to U. S. A. by the Secretary of Agriculture).

Alkyl substituted aromatic sulfonates. No. 2,467,130. Madison Hunt, Viktor Weinmayr and Mario Francesco Sartori (to E. I. du Pont de Nemours & Co.).

Alkyl substituted aromatic sulfonates. No. 2,467,131. Madison Hunt, Viktor Weinmayr and Mario Francesco Sartori (to E. I. du Pont de Nemours & Co.).

Alkyl substituted aromatic sulfonates. No. 2,467,132. Madison Hunt, Viktor Weinmayr and Albert Virgil Willett, Jr. (to E. I. du Pont de Nemours & Co.).

Distillation of ethyl benzene from styrene. No. 2,467,152. Ernest O. Ohsol and John A. Patterson (to Standard Oil Development Co.).

Alkyl substituted aromatic sulfonates. No. 2,467,170. Viktor Weinmayr (to E. I. du Pont de Nemours & Co.).

Glycidyl polyethers of polyhydric aromatic alcohols. No. 2,467,171. Ernest George Germain Werner and Evert Farenhorst (to Shell Development Co.).

Producing a hydrocarbon oil enriched in styrene from an oil containing styrene and at least one like-boiling alkyl benzene, by fractionally distilling a mixture of the oil and a glycol derivative of the group consisting of glycol ethers and glycol ether-esters. No. 2,467,197. Karl H. Engel (to Allied Chemical & Dye Corp.).

Azeotropic distillation of styrene from phenylacetylene with a glycol derivative of the group consisting of glycol ethers and ether-esters. No. 2,467,198. Richard B. Greene (to Allied Chemical & Dye Corp.).

Synthesis of piperazine by heating a substance selected from the group consisting of ethylenediamine and polyetheylene polyamines in the presence of aluminum phosphate and recovering piperazine. No. 2,467,205. William F. Gresham and Walter M. Bruner (to E. I. du Pont de Nemours & Co.).

Synthesis of esters by heating an organic compound containing non-aromatic olefinic unsaturation with carbon monoxide and a phenol in the presence of a catalyst containing an element of the class consisting of nickel and cobalt. No. 2,467,206. William F. Gresham and Richard E. Brooks (to E. I. du Pont de Nemours & Co.).

Liquid urea-formaldehyde compositions. No. 2,467,212. Haline M. Kvalnes (to E. I. du Pont de Nemours & Co.).

Obtaining thiols by heating a carboxylic acid ester of a 1,1-alkane diol and hydrogen in contact with a sulfactive hydrogenation catalyst and hydrogen sulfide. No. 2,467,222. Albert Alan Pavlic (to E. I. du Pont de Nemours & Co.).

Catalytic oxidation of methylal to formaldehyde by oxidizing methylal with oxygen to formaldehyde in the vapor phase and in the presence of a methanol oxidation catalyst. No. 2,467,223. Willard A. Payne (to E. I. du Pont de Nemours & Co.).

Preparing monoesters of thiodiacetic acid by reacting a trialkylamine wherein the alkyl radicals contain up to five carbon atoms, with thioglyc-

colic acid to form a trialkylammonium salt of thioglycolic acid; reacting said trialkylammonium salt of thioglycolic acid with an ester of a haloacetic acid. No. 2,467,303. Frederick C. Frank (to Socony-Vacuum Oil Co., Inc.).

Producing unsaturated aliphatic terpene derivatives by reacting a mixture of an aliphatic terpene of the group consisting of myrcene, ocimene and alloocimene and a normally liquid volatile organic solvent selected from the group consisting of the non-benzenoid monocarboxylic acids, aliphatic alcohols, esters, ethers, alcohol-ethers and mixtures thereof in the presence of a catalyst and a phenolic antioxidant. No. 2,467,330. Nicholas A. Milas (to Union Bay State Chemical Co., Inc.).

Refining of alkyl phenols. No. 2,467,355. Stephen P. Cauley (to Socony-Vacuum Oil Co., Inc.).

α-Amino-3,4-dihydroxybutyrophenone hydrochloride. No. 23,100. Chester Merle Suter and Arlo Wayne Ruddy (to Winthrop-Stearns, Inc.).

Na-p-chlorophenyl-Na-isopropyl biguanide. No. 2,467, 371. Francis Henry Swinden Curd and Francis Leslie Rose (to Imperial Chemical Industries, Ltd.).

Reacting hydrogen cyanide with an aliphatic halide containing 2 to 4 carbon atoms and selected from the group consisting of dihaloalkanes and alkenyl monohalides in vapor phase to form the corresponding unsaturated nitrile. No. 2,467,373. Harris A. Dutcher and I. Louis Wolk (to Phillips Petroleum Co.).

Monomeric 1,1-dicyano ethylene containing as a stabilizer the oxides and sulfides of phosphorous. No. 2,467,378. Harry Gilbert (to B. F. Goodrich Co.).

Subjecting a mechanically inseparable mixture of lithium hydride and a refractory oxide to the action of a solution of an aluminum halide in diethyl ether thereby producing a solution of a metal hydride in ether and solid lithium halide. No. 2,468,260. Thomas R. P. Gibb, Jr. (to Metal Hydrides, Inc.).

Minimizing caking of a powdery physical mixture of particles of silica and particles of normal orthophosphate salt of alkali metal by dispersing throughout the mixture a small quantity of particles of hydrated trimagnesium orthophosphate. No. 2,468,448. Charles S. King (to Blockson Chemical Co.).

Forming disodium orthophosphate dihydrate by evaporating water from a body of concentrated solution of disodium orthophosphate by submerged combustion. No. 2,468,455. Max Metziger (to Blockson Chemical Co.).

Manufacturing resistance elements by sintering a mixture of magnesium and titanium oxides in a reducing gas stream. No. 2,468,458. Adriaan Abraham Padmos and Evert Johannes Willem Verwey (to Hartford National Bank and Trust Co.).

Separating anhydrous hydrogen fluoride from fluorinated organic compounds which are soluble in hydrogen fluoride and which are produced in the synthesis of perfluoro-dimethyl-cyclohexane which comprises extracting said fluorinated organic compounds from the hydrogen fluoride with an organic solvent selected from the group consisting of perfluoromethyl-cyclohexane and perfluoro-dimethyl-cyclohexane. No. 2,468,681. Robert H. McBride (to U. S. A. by the U. S. Atomic Energy Commission).

Metals

Removing from zinc, zinc alloys and zinc coated materials the effects of oxidation by immersing the metal in a bath comprising tartaric acid, ammonium chloride, and mercuric chloride. 2,465,987. Daniel A. Gorman, Sr.

Producing elemental boron by contacting a metal selected from the group consisting of alkali and alkaline earth metals, with a fluoborate salt, fusing, dissolving out impurities and recovering elemental boron. 2,465,989. Frank J. Sowa.

Electropolishing of metallic tantalum by making it anodic in an electrolyte, containing hydrogen fluoride and sulfuric acid. 2,466,095. John Frederick Gall and Henry Conrad Miller (to Pennsylvania Salt Mfg. Co.).

Lead plating bath consisting of lead acetate, sodium acetate, acetic acid, bone glue, sucrose, and 2-naphthol-6-sulfonic acid. 2,466,660. Theron A. Loveland, Jr. (to Republic Steel Corp.).

Froth floatation of nonmetallic ores with black liquor soap in acid circuit. 2,466,671. Elmer William Gieseke (to American Cyanamid Co.).

Electrodeposition of nickel from an acid bath. 2,466,677. Henry Brown (to Udylite Corp.).

Forming an adherent, tough, chemically produced oxide coating upon an aluminum surface by treating with an aqueous solution containing alkali metal carbonate and one substance selected from the group consisting of casein, albumen, zein and gelatin. 2,466,971. Orry Leroy Shawcross (to Aluminum Co. of America).

Froth flotation of iron ores. 2,466,987. Earl Conrad Herkenhoff (to American Cyanamid Co.).

Starch-caustic in apatite-ilmenite froth flotation. 2,466,995. Lynn L. McMurray (to American Cyanamid Co.).

Obtaining vanadium concentrates from vanadiferous phosphatic materials by smelting vanadiferous phosphatic material with a carbonaceous reducing agent in the presence of iron to form ferro-phosphorus and blowing the vanadiferous ferro-phosphorus thereby formed in molten condition with oxygen-containing gas in the presence of an alkali-forming compound until the vanadium content is substantially completely oxidized. 2,467,039. Friedrich P. Kerschbaum and Harold T. Stowell (Kerschbaum assignor to Stowell).

Froth flotation of ores with aromatic alcohol. 2,467,369. William T. Bishop, Eugene J. Lorand and John E. Reese (to Hercules Powder Co.).

Electrodepositing nickel by electrolyzing an aqueous acid solution comprising a nickel salt and an organic compound selected from the group consisting of sulfonic acid derivatives of phenyl sulfones and sulfonic acid derivatives of naphthyl sulfones. 2,467,580. Henry Brown (to Udylite Corp.).

Electrolytic cleaning of metal consisting of caustic alkali and sodium chloride and sodium aluminate. 2,468,006. Hugh G. Webster (to J. H. Shoemaker).

Electrolytic apparatus for producing magnesium. 2,468,022. Robert D. Blue, Ralph M. Hunter and Marshall P. Neipert (to Dow Chemical Co.).

In the treatment of bituminous shales by reducing smelting for recovery of at least one of the metals vanadium, molybdenum, titanium and tungsten, the process which comprises first heating to oxidizing temperatures in the presence of air to lower its heavy metal-bound sulfidic sulfur content; adjusting the reducing agent content of the charge, adding basic, slag forming materials, fusing to form a metal bath and a siliceous slag bath, separating the metal bath and recovering the metal values therefrom. 2,468,654. Per Gunnar Brundell and Stig Harald Tjernstrom.

Organic

2,5-Dialkoxy-tetrahydrofurans. 2,465,988. David Gwyn Jones (to Imperial Chemical Industries, Ltd.).

Purifying at least one monomeric ester of the group consisting of the high boiling esters of acrylic and alpha-substituted acrylic acids by mixing with an aqueous solution of an alkali metal hydroxide and a chemically neutral, water soluble, organic substance from the group consisting of sucrose, glucose, urea, and mixtures of urea and sugars. 2,465,991. Arthur W. Anderson and Carleton A. Sperati (to E. I. du Pont de Nemours & Co.).

2'-Keto-3,4-imidazolido-2-thiophene-valeric acid. 2,466,004. Lee C. Cheney and John Robert Piening (to Parke, Davis & Co.).

Anthraquinone compounds containing a 2,2,2-trifluorolthylamino group. 2,466,008. Joseph B. Dickey (to Eastman Kodak Co.).

Anthraquinone compounds containing a 2,2-difluoroethylamino group. 2,466,009. Joseph B. Dickey (to Eastman Kodak Co.).

Nitrodiphenylamine compounds containing a sulfamyl group. 2,466,010. Joseph B. Dickey and James G. McNally (to Eastman Kodak Co.).

Nitrodiaphenylamine compounds containing a di-substituted sulfamyl group. 2,466,011. Joseph B. Dickey and James G. McNally (to Eastman Kodak Co.).

Amination of halobenzenesulfonyl-chlorides. 2,466,125. George W. Seymour, Victor S. Salvin and Wilford Donald Jones (to Celanese Corp. of America).

Neutralizing a substantially water-free halogenated hydrocarbon solvent contaminated with mineral acid by contacting with dry solid alkali pellets. No. 2,467,394. John B. Lovell and Mack C. Fuqua (to Standard Oil Development Co.).

Thiophene compounds. No. 2,467,439. Blaine Chase McKusick (to E. I. du Pont de Nemours & Co.).

Production of ketogulonic acid by oxidation of sorbose with nitric acid. No. 2,467,442. Johan Overhoff and Hendrik Willem Huyser (to Nederlandsche Centrale Organisatie Voor Toegepast-Natuurwetenschappelijk Onderzoek).

Manufacture of cyclic aliphatic dihydroxy compounds by heating a solution of a cyclic saturated aliphatic alpha: bet hydroxy-ketone under a hydrogen pressure in the presence of a catalyst selected from the group which consists of nickel and cobalt deposited on a carrier. No. 2,467,451. Donald Peter Young (to Celanese Corp. of America).

Production of esters of dioles and trioles of cyclopentane-poly-hydrophenanthrene series by reacting the polyhydroxy cyclopentano phenanthrene compound with a Grignard reagent in an inert solvent and reacting the Grignard derivative with an acid derivative selected from the group consisting of organic carboxy acid anhydrides and organic carboxy acid halides. No. 2,467,460. Ingolf Bennekou (to Lovens kemiske Fabrik v/Aug. Kongsted).

Converting a dry natural gas to liquid aromatic hydrocarbons by pyrolizing a mixture of natural gas with a halogen. No. 2,467,551. Everett Gorin and John R. Vorwerck (to Socony-Vacuum Oil Co., Inc.).

2,3-bis-(benzamidomethylthio)-propanol. No. 2,467,602. Frank K. Signaigo (to U. S. A. by the Secretary of War).

Manufacture of naphthyridones wherein a strong aqueous solution of a soluble azide is added to a substance selected from the class consisting of compounds containing 2-aza-fluorenone and compounds containing 4-aza-fluorene nuclei in sulphuric acid. No. 2,467,692. Vladimir Alexander Petrow (to Therapeutic Research Corp. of Great Britain, Ltd.).

Manufacture of aminonaphthyridines by heating a 2-halogeno-3:4-benzo-1:7 naphthyridine with a saturated solution of ammonia in the presence of a copper salt. No. 2,467,693. Vladimir Alexander Petrow (to Therapeutic Research Corp. of Great Britain, Ltd.).

In preparing aqueous dispersions of phenyl-beta-naphthylamine, the steps which comprise incorporating in aqueous dispersion, before the dispersion process is completed, a straight chain aliphatic monocarboxylic acid containing from 9 to 14 carbon atoms. No. 2,467,705. Bernard M. Sturgis (to E. I. du Pont de Nemours & Co.).

In preparing aqueous dispersion of phenyl-beta-naphthylamine the steps which comprise incorporating in such aqueous dipsersion, before the dispersion process is completed, a straight chain primary aliphatic mercaptan containing from 8 to 14 carbon atoms. No. 2,467,706. Bernard M. Sturgis (to E. I. du Pont de Nemours & Co.).

In preparing aqueous dispersions of phenyl-beta-naphthylamine, the steps which comprise incorporating in such aqueous dispersion, an alkyl ester of straight chain primary aliphatic monocarboxylic acid containing from 12 to 16 carbon atoms in the acid portion and in which the alkyl group contains not more than 4 carbon atoms. No. 2,467,707. Bernard M. Sturgis (to E. I. du Pont de Nemours & Co.).

An aqueous dispersion of phenyl-beta-naphthylamine prepared by a colloidal mixing operation with a dispersing aid, a liquid polymeric dimethyl silicone. No. 2,467,708. Bernard M. Sturgis (to E. I. du Pont de Nemours & Co.).

Production of ammeline by reacting dicyandiamide with a member of the group consisting of alkali metal, alkaline earth metal and ammonium cyanates. No. 2,467,712. Henry A. Walter (to Monsanto Chemical Co.).

5,5'-dihydroxydiamyl ether. No. 2,467,798. Kliem Alexander and Lester E. Schniepp (to U. S. A. by Secretary of Agriculture).

In recovering alcohol from a hydrolyzed mixture of alkyl sulfates and sulfuric acid by distillation to remove alcohol, the improvement which comprises carrying out such distillation in the presence of a small amount of hydroxy alkyl sulfonate. No. 2,467,846. Henry O. Mottern and Francis M. Archibald (to Standard Oil Development Co.).

Preparation of beta-acetoxypropionic acid by preparing a solution of beta-acetoxypropionaldehyde in glacial acetic acid, containing beta-acetoxypropionaldehyde of a cobalt chelate salt of a beta-diketone, aerating with an oxygen-containing gas until reaction is substantially complete. No. 2,467,876. Seaver A. Ballard, Bradford P. Geyer and Robert H. Mortimer (to Shell Development Co.).

Harmless spermicide selected from the class consisting of straight chain fatty monohydroxyl alcohols having from 8 to 11 carbon atoms in the chain, branched chain fatty alcohols from 8 to 18 carbon atoms in the chain, glyceryl, ethylene glycol and propylene-glycol monoethers of the alcohols mentioned, polyethylene glycol and polypropylene glycol monoethers of these alcohols, glyceryl, ethylene glycol and propylene glycol monoesters of unsaturated fatty acids having from 10 to 18 carbons in the chain, the polyethylene glycol and the polypropylene-glycol monoesters of fatty acids, saturated and unsaturated, having from 10 to 18 carbons in the chain, glyceryl monolactate monoesters of unsaturated fatty acids of 19 to 18 carbon atoms, and mixtures thereof. No. 2,467,884. Nathaniel M. Elias.

Piperazine carboxamides. No. 2,467,893. Samuel Kushner and Louis Brancone (to American Cynanamid Co.).

Preparing monoalkyl and dialkyl carbamyl piperazines. No. 2,467,894. Samuel Kushner and Louis Brancone (to American Cyanamid Co.).

Piperazine derivatives. No. 2,467,895. Samuel Kushner and Louis Brancone (to American Cyanamid Co.).

Reaction product of a drying oil with ester consisting of an unsaturated alcohol ester of an olefinic-alpha-beta-dicarboxylic acid, said unsaturated alcohols being selected from the class consisting of allyl, methallyl, crotyl and propargyl alcohols. No. 2,467,912. John B. Rust (to Montclair Research Corp.).

Production of cyclohexane by catalytic hydrogenation of benzene. No. 2,467,919. Jan Jacob Bernard van Eijk van Voorthuysen and Willem Frederik Engel (to Shell Development Co.).

Monomeric alkyl ester of alpha-cyano acrylic acid containing nitric oxide as a stabilizer against polymerization. No. 2,467,926. Alan E. Ardis (to B. F. Goodrich Co.).

Monomeric alkyl esters of alpha-cyanoacrylic acid containing phosphorous pentoxide as a stabilizer. No. 2,467,927. Alan E. Ardis (to B. F. Goodrich Co.).

Manufacture of formaldehyde from methane, air and nitrogen oxides. No. 2,467,993. Raymond P. Rossman (to Godfrey L. Cabot, Inc.).

Beta amino propionates. No. 2,468,012. Arthur F. Isbell (to General Mills, Inc.

Cyanoethyl-substituted 1,3,5-trimethylene trisulfones. No. 2,468,015. Harry Thurston Hookway and Edward Michael Evans (to British Resin Products, Ltd.).

Manufacture of guanidine nitrate comprising: dissolving ammonium thiocyanate and ammonium nitrate in ammonia; heating; and recovering guanidine nitrate. No. 2,468,067. William H. Hill (to Kopppers Co., Inc.).

The halogen and sulphur containing reaction product obtained by treating halogenated foots oil with an inorganic sulphur bearing material selected from the class consisting of inorganic hydrosulphides, inorganic sulphides, inorganic polysulphides, elemental sulphur, and sulphur chloride. No. 2,468,089. Bert H. Lincoln and Gordon D. Byrkit (to Lubrizol Development Corp.).

5,5-di(α-thienyl) hydantoin. No. 2,468,168. William G. Bywater and William R. Coleman (to Parke, Davis & Co.).

Treating starch by heating a mixture of the starch, water and sodium stannate. No. 2,468,207. Ralph Waldo Kerr (to Corn Products Refining Co.).

$Cl_3C\text{-}CH_2\text{-}CR_3R_4Br$ where R_3 is hydrocarbon, and R_4 is a radical of the class consisting of hydrogen and methyl. No. 2,468,208. Morris S. Kharasch (to U. S. Rubber Co.).

Preparation of imidazolones. No. 2,468,324. Robert Duschinsky (to Hoffmann-La Roche, Inc.).

Cyano acylamino tricarboxylate compounds. No. 2,468,352. Donald T. Warner and Owen A. Moe (to General Mills, Inc.).

Producing acetonitrile from a mixture of ammonia and acetylene in the presence of a compound catalyzer comprising zinc oxide, alumina, and chromium oxide and a small amount of an alkaline substance. No. 2,468,363. Jean Leon Maurice Frejacques (to Compagnie de Produits Chimiques et Electrometallurgiques Alais.).

Producing substituted 2-amino-thiazoles by reacting a ketone having the $-CO-CH_2$ grouping with thiourea. No. 2,468,401. Lafayette Carroll King and Raymond M. Dodson (to Research Corp.).

Carboalkoxyalkylcarboalkoxy sulfides. No. 2,468,426. Lee C. Cheney and John Robert Piening (to Parke, Davis & Co.).

o-alkoxybenzoyl derivatives or 4,4'-diaminostilbene-2,2'-disulfonic acid. No. 2,468,431. Dale R. Eberhart, Hans Z. Lecher and Mario Scalera (to American Cyanamid Co.).

Dimerizing a butadiene compound by contacting with a contact mass consisting of silicon carbide. No. 2,468,432. Herbert L. Johnson (to Sun Oil Co.).

Producing carboxylic aliphatic nitriles by treating an unsaturated aliphatic nitrile of a higher fatty acid with an oxidizing agent to cause cleavage at the point of unsaturation to produce acid nitriles, and aliphatic monocarboxylic acids. No. 2,468,436. J. D. Fitzpatrick and Latimer D. Myers (to Emery Industries, Inc.).

Apparatus for the recovery of crude benzole from benzolized wash-oil. No. 2,468,514. Douglas Rider and William James Chadder (to Woodall-Duckham, Ltd.).

In the production of nitriles from ammonia and olefin, the improvement which includes bringing a mixture containing ammonia and the olefin into contact with a catalyst consisting of a catalytically active reduced oxide of a metal selected from the group consisting of cobalt and nickel deposited on titanium dioxide as a carrier. No. 2,468,522. John W. Teter (to Sinclair Refining Co.).

Preparing omega ketones, by condensing in the presence of an acid binding agent acetyl acetic acid with a benzthiazolium quaternary salt bearing at position 2 a reactive thioether group. No. 2,468,577. Andre E. Van Dormael and Theofiel H. Ghys (to Gevaert Photo-Producten N. V.).

Trihaloalkylideneamines. No. 2,468,593. Stephen C. Dorman (to Shell Development Co.).

Producing flavanthrones by condensing a beta amino anthraquinone containing the alpha position ortho to the amino group free with a condensing agent selected from the group consisting of titanium tetrachloride and titanium tetrabromide and hydrolyzing the titanium complex produced. No. 2,468,599. Hans Z. Lecher, Mario Scalera and Warren S. Forster (to American Cyanamid Co.).

Diamino dianthrimide acridones. No. 2,468,605. Mario Scalera and Asa W. Joyce (to American Cyanamid Co.).

Producing isodibenzanthrone by heating a mixture whose sole significant ingredients are Bz-1-Bz-1'-dibenzanthronyl sulfide, alkali metal alkoxide and an aliphatic alcohol containing not more than six carbon atoms. No. 2,468,606. Mario Scalera and Warren S. Forster (to American Cyanamid Co.).

Manufacture of thymol by sulphonating meta-cresol to produce a mixture of meta-cresol mono- and di-sulphonic acids, treating the sulphonation mixture with a quantity of propylating agent selected from the group consisting of isopropyl alcohol, normal propyl alcohol and propylene desulphonating the sulphonic acids present to produce meta-cresol and a mixture of propylated meta-cresols, separating the meta-cresol and isolating thymol. No. 2,468,670. Walter Edward Huggett and George Frank Duffin (to Howards & Sons, Ltd.).

Making methylol alkanes by reaction of formaldehyde with an aqueous solution of a water soluble aldehyde of the formula R.CHO in contact with a water soluble alkaline earth metal hydroxide. No. 2,468,718. Joseph A. Wyler (to Trojan Powder Co.).

Dehydrating a pentaerythritol selected from the group consisting of pentaerythritol, dipentaerythritol and tripentaerythritol by forming a mixture of the selected pentaerythritol with the sulfonic acid of a monocyclic aromatic hydrocarbon and heating. No. 2,468,722. Joseph A. Wyler (to Trojan Powder Co.).

Paper & Pulp

Digesting pulp by the alkaline process. No. 2,466,290. Sidney D. Wells (to Institute of Paper Chemistry).

Petroleum

Hydrocarbon conversion with a pretreated montmorillonite clay catalyst. No. 2,466,050. Hubert A. Shabaker, George Alexander Mills and Ruth C. Denison (to Houdry Process Corp.).

Hydrocarbon conversion with a pretreated kaolin clay catalyst. No. 2,-

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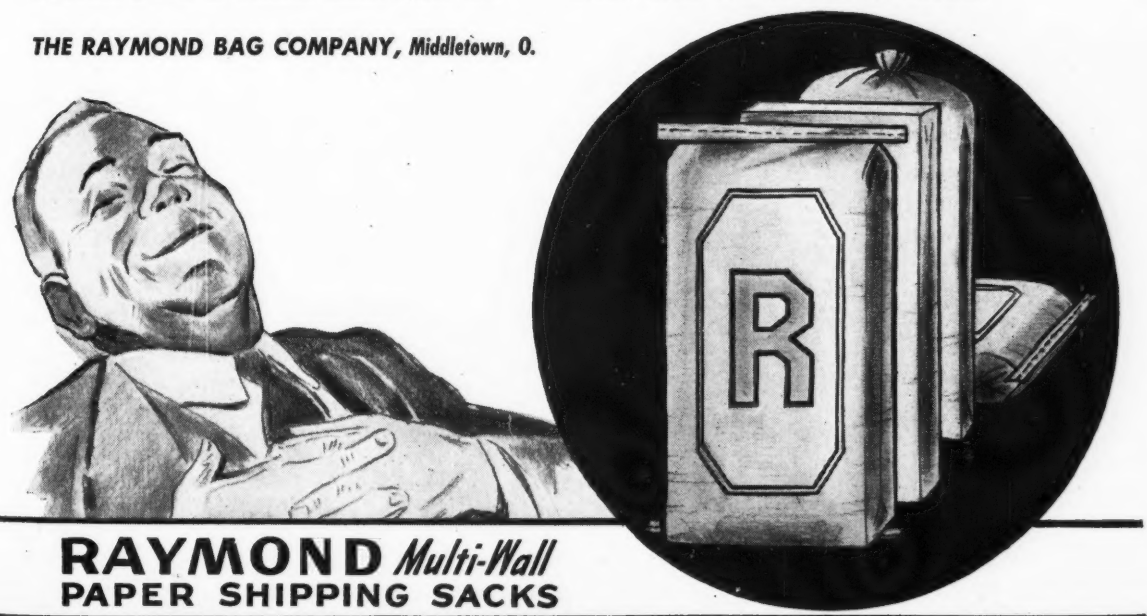

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466,051. Hubert A. Shabaker, George Alexander Mills and Ruth C. Denison (to Houdry Process Corp.).

Manufacture of high octane aviation gasoline by recovering a C_4 fraction containing butylenes and a C_3 and lighter condensate fraction containing ethylene and methane, subjecting the said C_3 and lighter condensate fraction to thermal conversion to increase the ethylene content while reducing the C_3 content, recovering the ethylene and alkylating isobutane with ethylene in the presence of an aluminum halide catalyst to produce mainly 2,3-dimethyl-butane. No. 2,466,334. William E. Skelton (to Texas Co.).

Solution in lubricating oil of a heavy metal salt of an oil-soluble di-ester of dithiophosphoric acid. No. 2,466,408. Charles Earle Funk, Jr. (to American Cyanamid Co.).

Multiple state shale eduction process. No. 2,466,593. Philip H. Jones (to Union Oil Co. of Calif.).

Method for increasing flow of wells by introducing hydrofluoric acid and at least one ammonium salt selected from the group consisting of ammonium nitrite and ammonium nitrate. No. 2,466,673. Daniel J. Mullady.

Method for increasing flow of wells by introducing into said wells hydrochloric acid and at least one ammonium salt selected from the group consisting of ammonium nitrite and ammonium nitrate. No. 2,466,674. Daniel J. Mullady.

Cracking hydrocarbons in the presence of fluoborate catalyst. No. 2,466,706. Everett C. Hughes and Samuel M. Darling (to Standard Oil Co.).

Mineral lubricating oil having dissolved a complex compound formed between a polyvalent metal hydrocarbon sulfonate and an ammonium salt of an inorganic acid, said salt being selected from the class consisting of ammonium chloride and ammonium nitrate. No. 2,467,118. Gordon W. Duncan and John C. Zimmer (to Standard Oil Development Co.).

Synthesis of hydrocarbons from hydrogen and carbon monoxide by passing a mixture of hydrogen and carbon monoxide over a catalyst prepared by adding a water-soluble alkaline compound to an aqueous solution of a water-soluble iron salt to the point of incipient precipitation, then adding gallic acid to complete the precipitation. No. 2,467,282. Benjamin R. Warner (to Gulf Research & Development Co.).

Preparing a catalyst suitable for synthesis of hydrocarbons from hydrogen and carbon monoxide by adding a water-soluble alkaline compound to an aqueous solution of a water-soluble iron salt to the point of incipient precipitation, then adding gallic acid to complete the precipitation. No. 2,467,283. Benjamin R. Warner (to Gulf Research & Development Co.).

Producing hydrocarbons of branched carbon structure by subjecting a reactive hydrocarbon under conversion conditions to the action of a catalyst prepared by reacting boric acid and a metal halide of the Friedel-Crafts type with the evolution of hydrogen halide. No. 2,467,326. Julian M. Mavity (to Universal Oil Products Co.).

Catalytic conversion of fischer synthesis product contaminated with oxygen containing compounds into hydrocarbons by contacting with a catalyst comprising a synthetic magnesium silicate containing from a trace up to about 1% zeolitic sodium oxide. No. 2,467,407, Robert F. Ruthruff.

Treating sulfur-containing crude petroleum to prevent formation of deleterious sulfur compounds by adding an oil-soluble cupric compound and heating. No. 2,467,429. Charles O. Hoover (to Air Reduction Co., Inc.).

Lubricating oil composition comprising a petroleum lubricating oil, a minor proportion of calcium iso-octyl salicylate, and an olefin sulfide. No. 2,467,713. Franklin M. Watkins (to Sinclair Refining Co.).

Production of motor fuel of high octane rating from a butane-butene mixture which comprises isobutane with the butenes in the presence of liquid hydrogen fluoride. No. 2,467,731. Jack Calhoon Dart, Carl S. Kuhn, Jr., Joe E. Penick and Urban H. Wagner (to Socony-Vacuum Oil Co., Inc.).

Controlling catalyst activity in the catalytic synthesis of hydrocarbons from CO and H_2, employing the fluid catalyst technique, which comprises passing a synthesis gas through two conversion zones. No. 2,467,802. Frank T. Barr (to Standard Oil Development Co.).

Lubricating oil composition comprising a waxy mineral lubricating oil containing a pour depressor and a pour sensitizer, said pour depressor consisting of a Friedel-Crafts condensation product of naphthalene with chlorinated paraffin wax, and said pour sensitizer being a fraction having an average molecular weight of about 500, obtained by amyl alcohol extraction of said pour depressor. No. 2,467,836. Eugene Lieber and Martin M. Sadlon (to Standard Oil Development Co.).

Diolefin extraction from a hydrocarbon mixture of said diolefin and of an alkyl alpha-acetylene by contacting the hydrocarbon mixture with a cuprous salt solution that keeps copper acetylides formed, in solution. No. 2,467,845. Charles E. Morrell and Miller W. Swaney (to Standard Oil Development Co.).

Production of gasoline. No. 2,467,920. Hervey H. Voge, Bernard S. Greensfelder and Norman E. Peery (to Shell Development Co.).

Treatment of cracked gasoline by contacting a cracked gasoline with hydrogen chloride under hydrochlorinating conditions to form alkyl chlorides containing alkyl chlorides to the action of an isomerization catalyst predominating in hydrogen fluoride to isomerize at least a portion of said alkyl chlorides, separating the isomerate from the isomerization catalyst, subjecting said isomerate to the action of a dehydrochlorinating catalyst, separating hydrogen chloride and recycling said hydrogen chloride. No. 2,467,965. Joseph A. Chenicek (to Universal Oil Products Co.).

Manufacturing gasoline and Diesel fuel with minimum amounts of light gases and no heavy residues by reacting carbon monoxide and hydrogen. No. 2,467,966. Alfred Clark (to Phillips Petroleum Co.).

Lubricant, promoting combustion of deposits in the combustion zone of internal combustion engines which comprises a lubricating oil and the reaction product of phosphorus sulphide on degras and chromium naphthenate. No. 2,468,031. Robert E. Burk and Everett C. Hughes (to Standard Oil Co.).

Increasing the melting point of a soda base lubricating grease by adding a low molecular weight fatty acid selected from the group which consists of glycolic and lactic acids, and mixtures thereof. No. 2,468,098. Arnold J. Morway and Cloyce R. Daniels (to Standard Oil Development Co.).

Lubricating grease composition consisting of a mineral base lubricating oil thickened with a fatty material which has been saponified with a compound selected from the alkali metal and alkaline earth metal hydroxides, oxides and mixtures thereof. No. 2,468,099. Arnold J. Morway (to Standard Oil Development Co.).

Breaking petroleum emulsions of the water-in-oil type, by subjecting the emulsion to the action of a demulsifier including a cation-active polychloride, said cation-active polychloride being the reaction product of diglycol chloroformate and an oxyalkylated imidazoline substituted in the 2-position by a radical containing 11 to 22 carbon atoms. No. 2,468,180. Melvin De Groote and Bernhard Keiser (to Petrolite Corp., Ltd.).

Breaking petroleum emulsions of the water-in-oil type, by subjecting the emulsion to the action of a demulsifier including a cation-active polychloride, said cation-active polychloride being the reaction product of diglycol chloroformate and a hydroxylated acylated polyaminoether obtained by a condensation reaction between a member of the class consisting of high molal monocarboxy acids and their glycerides in combination with triethanolamine. No. 2,468,181. Melvin De Groote and Bernhard Keiser (to Petrolite Corp., Ltd.).

Hydrocarbon synthesis by the reaction of carbon oxides and hydrogen in the presence of a finely divided fluidized solid catalyst. No. 2,468,494. Lindsay I. Griffin, Jr. (to Standard Oil Development Co.).

Improving the pour point stability of a wax modifier made by an initial Friedel-Crafts condensation of chlorinated paraffin wax with a low molecular weight aromatic compound in the presence of an inert solvent. No. 2,468,500. Eugene Lieber, Edward P. Cashman and Raymond M. Dean (to Standard Oil Development Co.).

Lubricating composition comprising a waxy mineral lubricating oil, a high molecular weight condensation product of chlorinated paraffin wax and naphthalene, and a polymeric compound prepared by pyrolyzing a high molecular weight fatty acid chloride. No. 2,468,501. Eugene Lieber and Aloysius F. Cashman (to Standard Oil Development Co.).

In the continuous method of manufacturing safety fuel from a C_4 hydrocarbon mixture containing butylenes, isobutylene and normal butane, the steps which comprise removing butylene-2 and normal butane, continuously passing residual C_4 mixture to a polymerization reaction zone containing a polymerization catalyst consisting of sulphuric acid. No. 2,468,507. Frank J. Moore and Ernest F. Pevere (to Texas Co.).

Pretreatment of gases for the synthesis of hydrocarbons which comprises contacting the feed stock in a desulfurization zone at desulfurization conditions with a solid desulfurization agent the active desulfurization component of which consists of a metal which does not form a metal carbonyl under the desulfurization condition used and thereafter directly with a dense, turbulent, fluidized suspension of powdered hydrocarbon synthesis catalyst in a separate synthesis zone. No. 2,468,510. John J. Owen (to Standard Oil Development Co.).

Lubricant comprising a waxy mineral lubricating oil and a chlorinated polyvinyl oleyl ether. No. 2,468,516. Raphael Rosen and William J. Sparks (to Standard Oil Development Co.).

Lubricating composition consisting of mineral oil, a halogenated hydrocarbon wax, and the reaction product of sperm oil, sulfur and a sulfide of phosphorus. No. 2,468,520. Lorne W. Sproule and Laurence F. King (to Standard Oil Development Co.).

Preparing aviation safety fuel components which comprises forming a catalyst solution of sulfuric acid with a small proportion of an aliphatic sulfate containing alkyl groups of 1 to 3 carbon atoms. No. 2,468,529. Alexis Voorhies, Jr. and Ashley R. Sydnor, Jr. (to Standard Oil Development Co.).

In a process wherein paraffin hydrocarbons containing more than four but less than seven carbon atoms are isomerized by passage in admixture with hydrogen chloride through a reaction zone containing an aluminum chloride isomerization catalyst. No. 2,468,549. Bernard L. Evering and Edmond L. d'Ouville (to Standard Oil Co.).

Water clay base drilling fluid for use in oil and gas well drilling, consisting of water, clay, and an alkali metal tall oil soap. No. 2,468,657. Milton Dyke and Edward Samuel Self (to Oil Well Chemical and Materials Co., Inc.).

Water clay base drilling fluid for use in oil and gas well drilling, consisting of water, clay and "floating soap". No. 2,468,658. Milton Dyke and Edward Samuel Self.

Removing free hydrogen sulfide from a liquid mixture of hydrocarbons by contacting said liquid mixture and an aqueous alkaline solution containing an alkali metal salt of an acid having a dissociation constant not substantially greater than about 9.1×10^{-8}, a hydroxy phenolic oxidation promoter capable of air oxidation and a soluble compound having an oxidation potential at unit activity between that of hydrogen sulfide and that of said oxidation promoter to cause said aqueous solution to absorb at least a portion of said hydrogen sulfide and to form a fat aqueous solution containing sulfide-sulfur. No. 2,468,701. Stephen P. Cauley (to Socony-Vacuum Oil Co., Inc.).

Photographic

Fine grain photographic developer containing monomethyl-p-amino phenol sulfate, sodium sulfite (anhydrous), ethylene diamine sulfate, sodium metaborate, potassium bromide, sodium chloride and water. No. 2,466,423. Richard W. Henn and John I. Crabtree (to Eastman Kodak Co.).

Preparation of diazo prints utilizing resorcinol carbonamides as coupling components. No. 2,467,358. Fred W. Neumann (to General Aniline & Film Corp.).

Photographic oxidizers and resists comprising a halogen selected from the group consisting of iodine and bromine, an aldehyde, and an acid selected from the group consisting of hydrochloric, sulphuric, and nitric acids. No. 2,467,359. Leon Rubinstein.

Polymers

Polythene compositions containing calcium carbonate. No. 2,466,038. Ernest Lewis Midwinter and Raymond Bliss Richards (to Imperial Chemical Industries, Ltd.).

In the emulsion polymerization of an unsaturated material selected from the group consisting of butadiene-1,3, isoprene, vinyl chloride, vinyl bromide, acrylonitrile, styrene, alphamethyl styrene, and a mixture of butadiene-1,3 and styrene in aqueous emulsion in the presence of an aqueous phase containing a partial ester formed from a fatty acid containing 10 to 20 carbon atoms per molecule and a poly-oxyalkylene derivative of a compound selected from the group consisting of the hexitols and their anhydrides, the poly-oxyalkylene portion of said partial ester being soluble in water. No. 2,466,212. Joseph D. Danforth (to Universal Oil Products Co.).

Continuous plasticization process for a high molecular weight, rubber-like copolymer with an aryl mercaptan plasticizer. No. 2,466,300. D. J. Buckley and A. L. Chaney (to Standard Oil Development Co.).

Polymerization of a mixture consisting of methylene malononitrile and vinyl acetate. No. 2,466,395. Joseph B. Dickey (to Eastman Kodak Co.).

Thermosetting composition comprising polyvinyl butyraldehyde acetal, an oil-soluble monohydric, para-substituted butyl phenolformaldehyde resinous condensation product, and a thermosetting ethyl ether of a methylol melamine. No. 2,466,399. Richard D. Dunlap (to Monsanto Chemical Co.).

Polyvinyl carbamates. No. 2,466,404. William F. Fowler, Jr. and William O. Kenyon (to Eastman Kodak Co.).

β-lactone ketene condensation products. No. 2,466,420. Hugh J. Hagemeyer, Jr. (to Eastman Kodak Co.).

Resinous copolymeric organo silicon oxide condensation product and ethyl cellulose. No. 2,466,434. Oscar Kenneth Johannson (to Corning Glass Works).

Production of sulfonated resin ion exchange agents in stable granular form. No. 2,466,675. William C. Bauman (to Dow Chemical Co.).

Polymerization of olefins in the presence of alkali and alkaline earth metal catalysts. No. 2,466,694. William V. Freed (to E. I. du Pont de Nemours & Co.).

Curing catalysts for aminoplasts comprising a salt of 2-amino butanol. No. 2,466,744. Milton J. Scott (to Monsanto Chemical Co.).

Preparing plastic substances from glycerol-containing fermentation stillage and dicarboxylic acids or anhydrides. No. 2,466,774. David A. Legg and Morton M. Rayman (to Publicker Industries Inc.).

Oil phase polymerization of resins. No. 2,466,800. Charles F. Fisk (to U. S. Rubber Co.).

Production of polyamides by heating a monomeric material consisting of an omega-amino normal saturated aliphatic carboxylic acid amide having the formula, $H_2N.CH_2$—$(CH_2)n$—$CO.NH_2$, where n is an integer varying from 4 to 8, under pressure and in the presence of **water to** bring about hydrolysis thereof, and removing ammonia gas that is liberated. No. 2,466,854. Theodoor Koch (to American Enka Corp.).

Alcohol-soluble phenol-modified coumarone-indene resin. No. 2,466,889. Lyle M. Geiger (to Neville Co.).

Polysulfide polymer. No. 2,466,963. Joseph C. Patrick and Harry R. Ferguson (to Thiokol Corp.).

Preparing a thermoset copolymer vinyl chloride and vinylidene chloride by incorporating hexamethylene ammonium hexamethylene dithiocarbamate and heating. No. 2,466,998. Thomas H. Rogers, Jr. and Robert D. Vickers (to Wingfoot Corp.).

Polymerization of polyhydric alcohol esters of alpha-olefinic dicarboxylic acids with ethyleneic monomers. No. 2,467,033. Everett C. Hurdis (to U. S. Rubber Co.).

Preparing solid, granular molding powders by incorporating into a thermoplastic resin a swelling agent for the resin, maintaining the resin at a temperature at which the said agent is removed by evaporation and bringing back the resin to normal temperature. No. 2,467,055. Marcel Sans, Yves Linizan and Robert Michon (to Societe Anonyme des Manufactures des Glaces et Produits Chimiques de Saint-Gobain.).

Production of polymeric alcohol by saponifying a carboxylic acid ester of a polymeric beta, gamma-monoolefinic monohydric alcohol to the corresponding polymeric alcohol, in a medium consisting of a lower aliphatic, non-tertiary alcohol. No. 2,467,105. David E. Adelson and Harold F. Gray, Jr. (to Shell Development Co.).

Curing catalysts for aminoplasts comprising a hydroxy amine salt in which a primary amino group is on a tertiary aliphatic carbon atom adjacent to at least one carbon atom to which an alcoholic hydroxyl group is attached. No. 2,467,160. Milton J. Scott (to Monsanto Chemical Co.).

Aqueous dispersions of synthetic linear polyamide. No. 2,467,186. Theodore Le Sueur Cairns (to E. I. du Pont de Nemours & Co.).

Iodoso diacylate catalysis of addition polymerization processes. No. 2,467,231. Lawrence M. Richards (to E. I. du Pont de Nemours & Co.).

Preparation of normally solid ethylene polymers by heating ethylene with a mixture containing tertiary butyl alcohol and sodio-N-chloro-p-toluenesulfonamide. No. 2,467,234. Donald Edward Sargent and William Edward Hanford (to E. I. du Pont de Nemours & Co.).

Polymerization of ethylene in the presence of liquid anhydrous ammonia and in the presence of a catalytic amount of a metal of group II of the periodic table. No. 2,467,245. Gerald M. Whitman and Samuel L. Scott (to E. I. du Pont de Nemours & Co.).

Di(aryl sulfonyl) peroxides as latent curing catalysts for acid-curing thermosetting materials. No. 2,467,280. Henry A. Walter (to Monsanto Chemical Co.).

Vinyl aromatic compositions containing colloidal silica. No. 2,467,339. Raymond B. Seymour (to Monsanto Chemical Co.).

Vinyl ester compositions containing colloidal silica. No. 2,467,340. Raymond B. Seymour (to Monsanto Chemical Co.).

Methacrylate compositions containing colloidal silica. No. 2,467,341. Raymond B. Seymour (to Monsanto Chemical Co.).

Polyvinyl acetal compositions containing colloidal silica. No. 2,467,342. Raymond B. Seymour (to Monsanto Chemical Chemical Co.).

Vinyl halide polymer compositions. No. 2,467,352. Thurman V. Williams, Jr. (to E. I. du Pont de Nemours & Co.).

Copolymerizing butadiene and a material from the class consisting of styrene and acrylonitrile. No. 2,467,382. Charles Henry Hempel (to Heresite & Chemical Co.).

Acrolein acetal polymers. No. 2,467,430. Emmette Farr Izard (to E. I. du Pont de Nemours & Co.).

Plasticized hydroxylated polymeric film. No. 2,467,436. Daniel D. Lanning (to E. I. du Pont de Nemours & Co.).

Synthetic resin adhesive base from cresylic acid and **furfural.** No. 2,467,498. Donald V. Redfern (to American-Marietta Co.).

Anion exchange resins obtained by bringing together one polyalkylene polyamine containing a primary amino group and a substituted 1,3,5-triazine containing at least two functional and amine reactive groups. No. 2,467,523. James R. Dudley (to American Cyanamid Co.)).

Copolymerizing a polymerizable liquid substance containing the CH_2=C= group which has no carbon-to-carbon conjugation, an unsaturated alkyd resin obtained by esterifying a mixture including a polyhydric alcohol and an alpha, beta-unsaturated polycarboxylic acid and an organic peroxide catalyst in the presence of a ferrous salt. No. 2,467,526. Raymond R. Harris (to American Cyanamid Co.).

Acceleration of the cure of copolymers with an organic peroxide catalyst and a stannous salt. No. 2,467,527. Raymond R. Harris (to American Cyanamid Co.).

Composition comprising chlorinated solid polythene and litharge and a hydrocarbon wax. No. 2,467,550. David Adams Fletcher and Robert Scott Taylor (to E. I. du Pont de Nemours & Co.).

Process for obtaining a substantially completely hydrolyzed interpolymer of vinyl acetate with ethylene, by mixing a methanol-water solution and sodium hydroxide. No. 2,467,774. Louis Plambeck, Jr. (to E. I. du Pont de Nemours & Co.).

Composition of matter comprising gelatin and polyvinylmorpholineurea. No. 2,467,832. Giffin D. Jones (to General Aniline & Film Corp.).

Preparing methyl-substituted polysiloxanes by heating a mixture comprising a liquid polymeric dimethylsiloxane and copolymerized monoethylsiloxane and a condensation catalyst. No. 2,467,853. Ralph L. Poskitt and George S. Irby, Jr. (to General Electric Co.).

Catalyst for acid curing thermosetting resins taken from the group consisting of the aldehyde reaction products of urea, thiourea, aminotriazines, and aminodiazines and a small amount of o-xenyl phosphoryl diamide. No. 2,467,915. Milton J. Scott (to Monsanto Chemical Co.).

Production of resin intermediates by reacting an aliphatic dibasic acid anhydride and a polyolefinic cyclic hydrocarbon fraction contaming about 2.5 to about 4 double bonds per molecule of which from about 40 to about 70 percent are conjugated. No. 2,467,958. Hermán S. Bloch (to Universal Oil Products Co.).

Increasing the average molecular weight of a completely dehydrated liquid polymeric dimethyl silicone by adding hydrochloric acid to said silicone and refluxing until an increase in viscosity is effected. No. 2,467,976. James Franklin Hyde (to Corning Glass Works).

Emulsion polymerization in the presence of an iron salt and a water soluble peroxide. No. 2,468,027. Edgar C. Britton and Walter J. Le Fevre (to Dow Chemical Co.).

Obtaining polymeric products by reacting vinylidene fluoride and a compound selected from the group consisting of ethylene and halogen substituted ethylenes in the presence of a polymerization catalyst comprising a peroxy compound. No. 2,468,054. Thomas A. Ford (to E. I. du Pont de Nemours & Co.).

Casting compositions comprising methyl methacrylate and glycol dimethacrylates. No. 2,468,094. Barnard Mitchel Marks (to E. I. du Pont de Nemours & Co.).

Azodisulfonic acid salts as polymerization catalysts. No. 2,468,111. James A. Robertson (to E. I. du Pont de Nemours & Co.).

In preparation of casting solutions comprising ethyl cellulose dissolved in a volatile solvent medium, the step which comprises adding to a solvent mixture comprising a low molecular weight aliphatic ketone, an aliphatic alcohol having at most three carbon atoms and an acetic acid ester of an alcohol selected from the group consisting of butyl and amyl alcohols, ethyl cellulose. No. 2,468,232. John H. Pritchard (to Celanese Corp. of America).

In the preparation of casting solutions comprising ethyl cellulose dissolved in a volatile solvent medium, the step which comprises adding to a solvent mixture comprising a low molecular weight aliphatic ketone and aliphatic alcohol, ethyl cellulose. No. 2,468,233. John H. Pritchard (to Celanese Corp. of America).

Polyvinyl alcohol composition comprising, as plasticizer, a first component of the group consisting of ethanol formamide and ethanol formamide and not over 40% of a polyhydric alcohol containing not over six carbon atoms, and a second component consisting of water. No. 2,468,345. Charles Arthur Porter (to Resistoflex Corp.).

Composition comprising a phenolic resin derived from the reaction of p-phenyl phenol with formaldehyde, hydrocarbon resin polymer produced by treating with sulphuric acid a hydrocarbon oil which has been physically separated from tar produced in the vapor phase pyrolysis of petroleum oil and which is free from and of greater volatility than the pitch of said tar. No. 2,468,413. Frank J. Soday (to United Gas Improvement Co.).

Composition comprising rubber-like copolymer of butadiene and styrene, and hydrogenated hydrocarbon resin. No. 2,468,414. Frank J. Soday (to United Gas Improvement Co.).

Oil-resin reclaiming blend for reclaiming sulfur-vulcanized rubber scrap, which contains resin and an oil in which the resin is soluble and which contains a fraction which is of such high boiling range that it is not lost in the blow-down after digestion of the rubber scrap. No. 2,468,482. Charles Herbert Campbell.

Polymerization process comprising the steps of cooling an olefinic material comprising a major proportion of isobutylene mixed with a minor proportion of a polyolefin having 4 to 14 carbon atoms, stirring into the olefinic material a substantial quantity of a polymerization catalyst comprising a double salt of aluminum bromide and aluminyl bromide in solution in butane, and thereafter adding a triggering catalyst comprising a portion of aluminum chloride in solution in ethyl chloride. No. 2,468,523. Robert M. Thomas, David W. Young and John D. Calfee (to Standard Oil Development Co.).

The polymerization product of a mixture of tetrafluoroethylene and polymerizable unsaturated organic compound containing a terminal ethylenic double bond. No. 2,468,664. William E. Hanford and John R. Roland, Jr. (to E. I. du Pont de Nemours & Co.).

A product of polymerization of a polymerizable mass, said mass including a compound represented by the general formula CH_2=CH—Ar—N=C=O where Ar represents a divalent aromatic hydrocarbon radical, the vinyl and isocyanate groupings being each directly attached to the aromatic nucleus. No. 2,468,713. Edward L. Kropa and Arthur S. Nyquist (to American Cyanamid Co.).

Processes & Methods

Process for carrying out gaseous reactions wherein a powder is alternately contacted with a plurality of gas streams. No. 2,468,508. John C. Munday (to Standard Oil Development Co.).

Controlling temperature in the bed of fluidized powdered catalytic material admixed with a gasiform material undergoing an exothermic reaction which comprises continuously adding to the said bed a powdered inert material cooled to a temperature not exceeding about 350° F. below the reaction temperature. No. 2,468,521. Sumner B. Sweetser and Lloyd B. Smith (to Standard Oil Development Co.).

In the continuous process of condensing an aliphatic aldehyde to the corresponding aldol wherein the aldehyde in liquid form is mixed with a liquid solution of an aldol condensation catalyst, the steps which comprise continuously bringing the liquid aldehyde and the catalyst solution into contact through a conduit under turbulent flow. No. 2,468,710. David C. Hull (to Eastman Kodak Co.).

Rubber

Plasticizing a rubbery copolymer, prepared by reacting isobutylene with a conjugated diolefin, plasticizer of the group consisting of monocyclic and dicyclic aryl mercaptans. No. 2,466,301. Joseph P. Haworth and Francis P. Baldwin (to Standard Oil Development Co.).

Preservation of synthetic rubber with aromatic arsenites. No. 2,466,810. Louis H. Howland and Byron A. Hunter (to U. S. Rubber Co.).

Detergent Rubber. No. 2,466,826. William Romain, Jr.

Treating a conjugate diolefin polymer rubber latex by incorporating one salt of weak acid of the group consisting of carbonic, formic, acetic, propionic and butyric acids and a base of the group consisting of ammonia and amines. No. 2,467,053. John S. Rumbold (to U. S. Rubber Co.).

Increasing particle size of synthetic rubber latices by adding a non-colloidal alkali salt of an acid of the group consisting of carbonic, oxalic, formic, acetic, propionic, butyric, boric, hydrochloric, and sulfuric acids in the presence of a water-soluble soap of abietic acid, and a water-soluble soap of a fatty acid having 9-17 carbon atoms in the aliphatic group and a surface-active agent which is selected from the group consisting of alkali-metal alkyl sulfates, alkali-metal alkyl sulfonates, alkali-metal salts of sulfonated ethers of long and short chain aliphatic groups, alkali-metal salts of sulfated ethers of long and short chain aliphatic groups, alkali-metal salts of sulfonated alkyl esters of long chain fatty acids, alkali-metal salts of sulfonated glycol esters of long chain fatty acids, alkali-metal salts of sulfonated alkyl substituted amides of long chain fatty acids, alkali-metal alkyl aryl sulfonates, polyether alcohols, and polyglycol esters. No. 2,467,054. John S. Rumbold (to U. S. Rubber Co.).

Zinc salts of aromatic mercaptans as processing agents for rubbers. No. 2,467,789. John J. Verbanc (to E. I. du Pont de Nemours & Co.).

Incorporating in a rubber composition, a vulcanization retarding filler, and vulcanizing ingredients including sulfur, zinc oxide, an amine selected from the class consisting of the mono-amines of the alkyl, aralkyl, and mixed alkyl aryl series which are reactive with carbon disulfide, and additionally an organic nitrogen base unreactive with carbon disulfide and afterwards exteriorly exposing the mixed and formed rubber stock to carbon disulfide. No. 2,468,159. Bernard C. Barton (to U. S. Rubber Co.).

Preserving a rubbery polymer of butadiene-1,3 and styrene by incorporating an acetal of a hydroxy aldehyde. No. 2,468,309. Robert L. Sibley (to Monsanto Chemical Co.).

Specialties

Artificial snow comprising mixing an aqueous suspension of starch with a

warm aqueous acidic solution of borax. No. 2,466,369. (Murriel H. Bunderson).

Preventing corrosion of metals by applying to such metals a substituted imidazoline. No. 2,466,517. Charles M. Blair, Jr. and William F. Gross (to Petrolite Corp., Ltd.).

Preventing corrosion of metals by applying to the metal surface a N-aliphatic 2,5 pyrrolinedione. No. 2,466,530. Charles M. Blair, Jr. and William F. Gross (to Petrolite Corp., Ltd.).

Carbon remover and metal surface cleaning composition comprising a mixture of kerosene, o-dichlorobenzene, diethylethanolamine oleate, diethylethanolamine, ethylene glycol monobutyl ether and water. No. 2,466,632. Ben Borus (to Shell Development Co.).

Lubricating composition consisting of a laminated foliated finely divided antiscoring agent from the class consisting of graphite, molybdenum disulfide, vermiculite, talc, tungsten disulfide, zinc oxide, calcium oxide, mica silver sulfate, and lead iodide; polyisobutylene, and a polymeric organic silicon-containing compound. No. 2,466,642. Robert G. Larsen (to Shell Development Co.).

A Cutting oil base from tall oil by esterifying the fatty acids in the tall oil with a quantity of polyhydric alcohol sufficient to convert said fatty acids to mono esters of the polyhydric alcohol and subsequently saponifying the resin acids into water soluble alkali metal soaps. No. 2,466,645. Latimer D. Myers and Victor J. Muckerheide (to Emery Industries, Inc.).

Fluid lubricating composition consisting of a water-insoluble lubricating oil and an organic polyalkyl tripolyphosphate ester. No. 2,466,647. Richard Stern (to Shell Development Co.).

Blue print marking composition consisting of a 10% aqueous solution of hydroxyethyl cellulose, water and sodium hydroxide. No. 2,466,799. John R. Fisher, Jr. (to Commonwealth Engineering Co. of Ohio).

Lubricating composition for use in metal machining operations consisting of a petroleum lubricating oil, turpentine oil, comminuted graphite, iron oxide and carbon tetrachloride. No. 2,466,927. James Albert Burton (to Graphol Products Co., Inc.).

Metalworking lubricant consisting of a mineral lubricating oil and a sulfurized oil which has been sulfurized in the presence of an alkylated phenol. No. 2,467,137. Hollis L. Leland (to Standard Oil Development Co.).

Lubricant grease of solid consistency consisting of acetylene black incorporated in a substantially hydrocarbon-insoluble, inert fluorinated hydrocarbon mixture. No. 2,467,145. Arnold J. Morway and John C. Zimmer (to Standard Oil Development Co.).

Colloidal lubricating grease consisting of a viscous unctuous mineral oil insoluble material selected from the group consisting of glycerin and petroleum insoluble non-drying glycerides of fatty acids, thickened to a grease-like consistency by incorporation of acetylene carbon black. No. 2,467,146. Arnold J. Morway and John C. Zimmer (to Standard Oil Development Co.).

Low-temperature lubricant consisting of an oily ester of the general formula $COOR_1—R—COOR_2$ wherein R is a bivalent aliphatic hydrocarbon radical and R_1 and R_2 are radicals selected from the group which consists of branched chain alkyl, alkaryl and cyclo alkyl hydrocarbon and substituted hydrocarbon radicals, thickened to a grease consistency of colloidal structure with a carbon black of abnormally high structure index. No. 2,467,147. Arnold J. Morway and John C. Zimmer (to Standard Oil Development Co.).

Lubricating composition consisting of acetylene black and an oily acrylonitrile-diolefin type copolymer. No. 2,467,148. Arnold J. Morway and David W. Young (to Standard Oil Development Co.).

Acid inhibitors for aqueous hydrochloric acid comprising a liquid product formed by direct reaction of sulphur with turpentine oil. No. 2,467,164. Harold R. Slagh (to Dow Chemical Co.).

Lubricant addition agents from an alkaline earth metal salt of a petroleum sulfonic acid by emulsifying oil-soluble mineral oil solution containing said salt with an alkaline earth metal chloride by weight heating in the presence of alkaline earth metal sulfonate. No. 2,467,176. John C. Zimmer, Einar W. Carlson and Gordon W. Duncan (to Standard Oil Development Co.).

Aqueous composition for heat exchange and pressure transmitting systems consisting of a mixture of a lower boiling water-soluble aliphatic alcohol and water and soluble liquid compound having the general formula $HO[M(RX)(R'X)OM(RX)(R'X)]_nOH$ wherein R is a hydrocarbon radical selected from the group consisting of aliphatic, cyclo-aliphatic and aromatic hydrocarbon radicals, R' is a hydrocarbon radical selected from the group consisting of aliphatic, cyclo-aliphatic and aromatic hydrocarbon radicals; X is selected from the group consisting of hydrogen, chlorine, bromine, iodine and fluorine; M is an element selected from the group consisting of silicon, titanium, germanium, and zirconium and n is an integer from 1 to 25. No. 2,467,177. John C. Zimmer (to Standard Oil Development Co.).

Penetrating oil composition consisting of an oily silicone polymer and an aromatic hydrocarbon solvent having 6 to 9 carbon atoms and an aromatic ester selected from the group consisting of tricresyl phosphate and tricresyl phosphite as an oiliness agent. No. 2,467,178. John C. Zimmer and Alan Beerbower (to Standard Oil Development Co.).

Electrooptical light valve of ammonium dihydrogen phosphate crystal. No. 2,467,325. Warren P. Mason (to Bell Telephone Labs., Inc.).

Calking composition; a mixture of oil-reclaimed rubber, zinc oxide, colophony, phenyl-betanaphthyl-amine, bitumen, acetone-aniline condensation product; and solvent. No. 2,467,362. Russell Harry Taylor (to Joseph E. Berman and R. C. Robinson).

Animal glue composition comprising animal glue, a reducing sugar and a selected ammonium compound to reduce or inhibit the resinification of the glue. No. 2,467,715. Thomas Aubrey White (to National Starch Products, Inc.).

Tough, elastic thermoplastic composition for use in the making of patters, composed of candelilla wax and the reaction product derived by heating rosin, glycerol and one oil selected from the group consisting of drying and semi-drying oils. No. 2,467,796. Hilary B. Willis (to Westinghouse Electric Corp.).

Mildewproofing composition containing copper naphthenate and bis-(5-chloro-2-hydroxyphenyl) methane. No. 2,468,068. Robert E. Horsey (to Givaudan Corp.).

Preventing corrosion of metals, by a substituted imidazoline. No. 2,468,163. Charles M. Blair, Jr. and William F. Gross (to Petrolite Corp., Ltd.).

Carnivorous fish repellent, comprising a preformed, shaped mass of asbestos fibers impregnated with formic acid. No. 2,468,394. Alfred Dinsley.

Adhesive composition comprising a dry remoistening mixture containing an intimate mixture of starch acetate, methyl cellulose and animal glue. No. 2,468,443. Ferdinand W. Humphner (to Mid-States Gummed Paper Co.)

Aqueous emulsion comprising bitumen as the dispersed phase, reemulsifiable bentonite as the emulsifying agent and water as the continuous phase, containing a water soluble, substantially neutral salt of a high potential alkaline earth metal to render dried films of said emulsion non-reemulsifiable. No. 2,468,533. Lee Worson (to Patent and Licensing Corp.).

Liquid dielectric and insulating composition consisting of halogenated aryl hydrocarbon and containing in solution an organo-metallic compound chosen from the group consisting of compounds having the formulae MRx and MRxY in which M is a metal chosen from the group consisting of tin, lead and mercury, R is an aromatic radical, x is an integer in the range of 2 to 4 and Y is a halogen. No. 2,468,544. Frank M. Clark (to General Electric Co.).

Thermoplastic cement consisting of methyl acetate, vinyl acetate polymer, hydrolyzed to 12%-18% acetate group content, phenol-formaldehyde resin and mica flour. No. 2,468,594. George F. Dustin and Robert B. Manning (to Western Electric Co., Inc.).

Water-base printing ink comprising an aqueous vehicle and pigment, an alkali-dispersible protein, a natural resin, sufficient caustic alkali to saponify the resin, and a sugar. No. 2,468,633. Vincent A. Lauderman (to Champion Paper and Fiber Co.).

Textiles

Transparentizing textiles by impregnating an open-meshed fabric with a resin ether. No. 2,466,066. Ernst Weiss (to Heberlein Patent Corp.).

Shrinkage control of textiles by impregnating with a aqueous dispersion of a curable alkylated methylol melamine and a formaldehyde-binding substance selected from the group consisting of urea, thiourea and mixtures thereof and then heating. No. 2,466,457. John Edward Lynn and Linton A. Fluck, Jr. (to American Cyanamid Co.).

Treating woolen materials by contacting with an alkaline hypochlorite solution. No. 2,466,695. Daniel Frishman and Milton Harris (to Harris Research Labs.).

Improved fibers of hydrolyzed ethylene/vinyl ester. No. 2,467,196. Melvin A. Dietrich (to E. I. du Pont de Nemours & Co.).

Shrinkproofing wool. No. 2,467,233. J. B. Rush (to Montclair Res. Corp.).

Making semi-stiff collars by coating a bleached cotton fabric with aqueous dispersion of polyvinyl chloride resin, titanium dioxide pigment ground in dioctyl phthalate, and dioctyl phthalate. No. 2,467,438. Dorman McBurney (to E. I. du Pont de Nemours & Co.).

Wet-spinning of acrylonitrile polymer yarn by extruding a solution, in a volatile organic solvent, of acrylonitrile polymer into a spinning bath comprising an aqueous solution of a zinc halide selected from the group consisting of zinc chloride, zinc bromide and zinc iodide. No. 2,467,553. Weston Andrew Hare (to E. I. du Pont de Nemours & Co.).

Reducing the swelling value and increasing the water repellency and wet strength of viscose rayon by reacting the rayon with an aqueous solution of a preformed monomeric compound of the class consisting of the dimethylol and the mono-methylol derivatives of mono- and di-substituted phenols, and their salts. No. 2,468,530. Johannes G. Weeldenburg (to American Enka Corp.).

Reducing the swelling value and increasing the acid resistance and wet strength of casein threads, fabrics and the like by reacting the casein products with an aqueous solution consisting of a preformed monomeric compound of the class consisting of the di-methylol and the mono-methylol derivatives of mono- and di-substituted phenols and their salts. No. 2,468,531. Johannes G. Weeldenburg (to American Enka Corp.).

Treating hydrogen-donor textile material to improve the properties thereof by treating a reactive product of polymerization of a polymerizable mass including an isocyanate represented by the general formula $CH_2{=}CH\text{-}Ar\text{-}N{=}C{=}O$ where Ar represents an aromatic hydrocarbon nucleus, the vinyl and isocyanate groupings being each directly attached to the aromatic nucleus, and heating. No. 2,468,716. Arthur S. Nyquist and Edward L. Kropa (to American Cyanamid Co.).

Water, Sewage and Sanitation

Removing cations from fluid media by bringing a fluid containing cations into contact with a water-insoluble composition of matter comprising the gelled and water-insolubilized products of reaction of a mixture including at least one aldehyde selected from the group consisting of furfural and formaldehyde, and sulfonated compounds. No. 2,468,477. Jack T. Thurston (to American Cyanamid Co.).

*Agricultural**

Plant regulant composition containing a compound selected from the group consisting of 2,4-dichlorophenoxyacetic acid, its esters, amides, and salts. No. 23,115. John F. Lontz (to E. I. du Pont de Nemours & Co.).

Insect repellent comprising benzyl ether as the essential active ingredient incorporated into zinc oxide. No. 2,469,228. Samuel I. Gertler.

Insecticidal and fungicidal composition comprising a normally liquid hydrocarbon and a dialkenyl diester of diglycollic acid wherein the alkenyl radicals each have from 3 to 4 carbon atoms and are selected from the group consisting of allyl and methallyl radicals. No. 2,469,317. Edward C. Shokal and Lynwood N. Whitehill (to Shell Development Co.).

Preventing plant injury attributable to acid lead arsenate by supplementing the conventional arsenical spray program by treatment of the plant surfaces with a composition including a 2.4-dinitrophenol as an active ingredient. No. 2,469,330. John H. Davidson (to Dow Chemical Co.).

Insecticidal use of fluoroacetamide. No. 2,469,340. Nellie M. C. Payne (to American Cyanamid Co.).

Phenylsemioxamazide insecticidal compositions. No. 2,470,160. Samuel I. Gertler (to U.S.A. by the Secretary of Agriculture).

Pesticidal composition of polyethylene polysulfide and nicotine sulfate. No. 2,470,529. William D. Stewart (to B. F. Goodrich Co.).

Insecticidal composition comprising alkyl-halo-naphthalene and pyrethrin. No. 2,471,265. Robert R. Dreisbach and Fred W. Fletcher (to Dow Chemical Co.).

Microbicidal agent comprising: the reaction product of dodecylamine, lactic acid and salicylic acid. No. 2,471,339. Arthur Minich and Milton Nowak (to Nuodex Products Co., Inc.).

*Cellulose**

Preparing a powder precipitate of cellulose triacetate by mixing an esterification mass, which contains an acylation catalyst with a neutralizing agent for the catalyst and aqueous acetic acid to dilute the mass, heating, then rapidly mixing into the solution sufficient aqueous acetic acid to bring the acid concentration of the mass down to 30-40-% thereby precipitating the cellulose triacetate. No. 2,469,395. Carl J. Malm and Carlton L. Crane (to Eastman Kodak Co.).

Preparing a substantially water-insoluble, oil-impermeable product from a water-soluble cellulose ether, by preparing an aqueous solution of a water-soluble hydroxyl-containing cellulose ether, an amide selected from the group consisting of carbamide, thiocarbamide and the triamide of cyanuric acid and formaldehyde, adjusting the pH, heating, thereafter cooling it, adjusting the pH of the solution, drying to remove

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water, and heating the dry product to render it substantially insoluble in water. No. 2,469,431. Aubrey E. Broderick (to Carbide and Carbon Chemicals Corp.).

In producing hydroxy ethyl cellulose in which cellulose is reacted with sodium hydroxide and the resulting alkali cellulose is reacted with gaseous ethylene oxide, the steps of creating dry flocked cellulose fibers by flocking dry cellulose, and spraying aqueous sodium hydroxide solution on the dry flocked cellulose fibers. No. 2,469,764. Donald Robert Erickson.

Rapid ripening of cellulose esters. No. 2,470,191. George W. Seymour, Blanche B. White and Anthony J. Bellucci (to Celanese Corp. of America).

Rapid ripening of cellulose esters. No. 2,470,192. George W. Seymour, Blanche B. White and Anthony J. Bellucci (to Celanese Corp. of America).

Producing cellulosic pulp by digesting cellulosic material with sulphite liquor, withdrawing spent liquor after completion of the digestion; treating the spent liquor with an oxidizing agent separating the solid material, treating said liquor with a precipitating agent, separating the clear liquor from the precipitate, and employing the separated liquor for digestion. No. 2,470,764. Thomas Leonidas Dunbar.

Cellulose fibrous materials distinguished by a soft and agreeable feel, having uniformly distributed therethrough a colloidal sulfonic acid amide being insoluble in alkali carbonates and obtained by the simultaneous action of chlorine and sulfur dioxide on a mixture of saturated aliphatic hydrocarbons formed by the reduction of carbon monoxide, and subsequent reaction with ammonia. No. 2,471,039. Ludwig Orthner, Gerhard Balle, Heinz Schild, Max-Otto Schurmann, Karl Brodersen and Matthias Quaedvlieg (vested in the Attorney General of the U. S.).

Water-soluble cellulose ether plasticized with a cyclomethylene sulfone. No. 2,471,272. George W. Hooker and Norman R. Peterson (to Dow Chemical Co.).

Stabilizing nitrocellulose comprising boiling nitrocellulose with aqueous ammonium sulfate. No. 2,471,583. Richard E. Reeves and Joel E. Giddens (to U.S.A. by the Secretary of Agriculture).

*Ceramics**

Glass of very rapid fusion and high point of transformation comprising SiO_2, PbO, B_2O_3, Al_2O_3, and ZnO. No. 2,468,868. Andre Danzin and Edouard Despois (to Societe Francaise Radio-Electrique).

Mix for forming refractory concrete comprising calcium aluminate cement, refractory aggregate consisting of expanded vermiculite, and MgCl₂. No. 2,469,081. Arthur F. Ruedi (to Universal Atlas Cement Co.).

Infrared-transmitting glass, consisting of a reduced silicate glass containing colloidally dispersed antimony selenide. No. 2,469,490. William H. Armistead (to Corning Glass Works).

Ceramic dielectric consisting of an alkaline earth metal titanate and manganese dioxide. No. 2,469,584. Eugene Wainer and Allen N. Salomon (to National Lead Co.).

Special glass which has a low coefficient of expansion, a high softening temperature, and high resistance to chemical agents, composed of SiO_2, Na_2O, Al_2O_3, B_2O_3, ZnO, PbO, BaO, CaO, and MgO. No. 2,469,867. Andre Danzin (to Societe Francaise Radio Electrique).

*Coatings**

Wrinkle flexible material with rubber solution coating. No. 2,468,724. Nathan T. Beynon (to New Wrinkle, Inc.).

Uncooked wrinkle composition containing synthetic rubber and conjugated double bonded oil. No. 2,468,989. Enrique L. Luaces (to New Wrinkle, Inc.).

Wax-polyamide-pinene resin coating composition. No. 2,469,108. Karl W. Fries (to Rhinelander Paper Co.).

Wire coating compositions which consist of soft red iron oxide, fibrous magnesium silicate, litharge, aluminum stearate, congo-linseed oil varnish of 15 gallon oil length, and varnish maker's and painter's naphtha. No. 2,469,150. Willis E. Boak (to American Steel and Wire Co. of New Jersey).

Coating compositions embodying polyvinyl butyral resins. No. 2,469,320. Donald R. Swan (to Pittsburgh Plate Glass Co.).

Cellulose derivative coating composition. No. 2,469,348. Arthur E. Young and Elmer K. Stilbert (to Dow Chemical Co.).

*Detergents**

A solid mixture of alkyl aryl sulfonates in which the alkyl groups are derived from a hydrocarbon mixture which boils for the most part above 100° C., which solid mixture develops a rancid odor on being stored, and in admixture therewith a fraction of its weight of an amino-aromatic compound having not more than 10 nuclear carbon atoms per aromatic nucleus, as an odor inhibitor. No. 2,469,376. Lawrence H. Flett (to Allied Chemical & Dye Corp.).

Solid mixture of alkyl aryl sulfonates in which the alkyl groups are derived from a hydrocarbon mixture which boils for the most part above 100° C., which solid mixture develops a rancid odor on being stored, and in admixture therewith a fraction of its weight of a non-benzenoid organic oxidation inhibitor, as an odor inhibitor. No. 2,469,377. Lawrence H. Flett (to Allied Chemical & Dye Corp.).

Solid mixture of alkyl aryl sulfonates in which the alkyl groups are derived from a hydrocarbon mixture which boils for the most part above 100° C., which develops a rancid odor on being stored, and in admixture therewith a heterocyclic organic oxidation inhibitor, as an odor inhibitor. No. 2,469,378. Lawrence H. Flett (to Allied Chemical & Dye Corp.).

Detergent composition comprising a mixture consisting of a sulfonate of alkyl substituted aromatic hydrocarbon selected from the class consisting of benzene and naphthalene, and wherein the alkyl group has from 9 to 16 carbon atoms; and polyoxethylene ester of organic acid material selected from the class consisting of rosin and tall oil, containing an average of from 12 to 30 oxyethylene groups per carboxyl group. No. 2,469,493. George E. Barker (to Atlas Powder Co.).

Powdered soap product. No. 2,469,753. Joseph M. Tabor, Howard F. Seibert and Paul R. Frohring (to General Biochemicals, Inc.).

Aqueous household cleaning solution consisting of water and an alkali metal hexametaphosphate, triethanol amine, and wetting agent selected from the group consisting of alkyl aryl sulfonates, sulfonated alcohols, sulfonated castor oil and sulfonated soybean oil. No. 2,471,645. Mark M. Morris and Annette K. Kleeman (to Clorox Chemical Co.).

As a wetting agent a blend of water-soluble surface-active agent and a polyethyleneglycol diester. No. 2,471,945. Hans George Figdor (to E. F. Houghton and Co.).

*Dyes and Pigments**

In the printing cellulose esters with a color from the group consisting of acid and direct dyestuffs, the improvement which consists of applying the color by the aid of a printing paste containing as special assistants caprolactam and thiourea. No. 2,468,940. Charles Franklin Miller (to E. I. du Pont de Nemours & Co.).

Producing copper phthalocyanine pigments by heating a mixture of powdered metallic copper, urea, a catalyst, an oxidizing agent, and a compound selected from the group consisting of orthodicarboxylic acids, the ammonium salts, amides, imides, and anhydrides of such acids and the amides of orthocyanocarboxylic acids. No. 2,469,663. Frank H. Moser (to Standard Ultramarine Co.).

Monoazo dye compounds containing a butadiene-1,3 grouping. No. 2,469,682. Joseph B. Dickey (to Eastman Kodak Co.).

2-bis (5-cyclylpyrrole) azamethine dyes. No. 2,469,830. Edward Bowes Knott (to Eastman Kodak Co.).

Vat dyestuffs, 6-butanesulphonylbenzoylamino-3′:4-phthaloylacridone. No. 2,470,032. Robert Norman Heslop, Francis Irving and Alistair Livingston (to Imperial Chemical Industries,, Ltd.).

Dyeing wool with metallized dyes soluble in acid baths which comprises subjecting the material to be dyed to a dyebath containing the metallized dye and a water soluble condensation product of at least 16 to 18 mols of a lower alkylene oxide with a lower alkylolamide of a thermally dimerized drying oil acid. No. 2,470,080. Henry E. Millson and Shannon Mooradian (to American Cyanamid Co.).

Monoazo dye. No. 2,470,094. Joseph B. Dickey and James G. McNally (to Eastman Kodak Co.).

Complex calcium carbonate-silicate pigment product. No. 2,470,577. Howard F. Roderick and Fritz M. Zorn (to Wyandotte Chemicals Corp.).

Cyanine dyestuffs. No. 2,471,488. John David Kendall and Frank Peter Doyle (to Ilford Ltd.).

Monoazo pyrazolone dyes. No. 2,471,628. Oscar Knecht and Theodor Wirth (to Sandoz Ltd.).

Trisazo dyes. No. 2,471,664. Walter Wehrli and Fritz Kehrer (to Sandoz Ltd.).

Preparing a copper phthalocyanine by heating phthalyl halide, a cupriferous reagent and a member of the group consisting of urea and biuret. No. 2,471,794. Robert J. Sumner (to Roberts Chemical Co.).

Trinuclear iminol cyanine dyes. No. 2,471,996. Alfred W. Anish (to General Aniline & Film Corp.).

Liquid sulfur dye composition comprising an alkylol amine. No. 2,472,052. Robert Carland Conn (to American Cyanamid Co.).

*Explosives**

Blasting explosive composition comprising a liquid explosive nitric ester, at least one salt selected from the group consisting of ammonium nitrate and a mixture of ammonium nitrate and sodium nitrate, and a mixture of one dialkali hydrogen ortho-phosphate and at least one alkali metal dihydrogen ortho-phosphate. No. 2,470,733. Edward Whitworth and James C. Hornel (to Imperial Chemical Industries Ltd.).

Manufacture of detonating explosive compositions containing nitrocellulose, a crystalline high explosive compound sensitive to detonation by shock or friction selected from the group consisting of a solid crystalline nitric ester and a solid crystalline nitramine, an a liquid mixture comprising dinitrotoluenes and trinitrotoluene. No. 2,471,851. Harold Reginald Wright and James Taylor (to Imperial Chemical Industries Ltd.).

*Inorganic**

Recovery of chlorine from hydrogen chloride in an electrolytic process. No. 2,468,766. Frank S. Low (to Food Machinery and Chemical Corp.).

Treating sodium sulfate to remove the metal salt impurities by simultaneously adding trisodium phosphate and sodium sulfide and removing the precipitate. No. 2,468,803. Andre Bonnet and Pierre Costet (to Comptoir des Textiles Artificiels).

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* *From Vol. 622, Nos. 1, 2, 3, 4, 5.*

Trade marks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

COLORAMA PERMANENT TRIM COLORS. Paints, paint enamels, japans, varnishes, and wood fillers. 497,656. H. B. Davis Co.

DI-NOC. Lacquers and solutions in the nature of lacquer solvents for the mounting of transfers. 501,502. Di-Noc Co.

BIOPAL. Detergents having incidental germicidal properties. 505,696. General Dyestuff Corp.

Beautykote. Synthetic resins. 507,095. Beautykote Corp.

U-Sement. Liquid adhesive with rubber or resin base. 509,462. U. S. Rubber Co.

Jel-Klene. Cleanser. 509,463. Mitchell Labs.

Fire Stop. Liquid fire resisting wall finish paint. 509,505. Plicote, Inc.

DUZ-KIL. Insecticide. 509,523. Dill Co.

Stopweed. Ester form weed killer. 509,528. Centennial Flouring Mills Co.

BATES CLEANER. Cleaning compound for upholstery, rugs, and painted surfaces. 509,983. R. B. Bates Mfg. Co.

Rope Treat. Liquid dressing for hard twist nylon, manila, and sisal ropes. 509,988. Rope Treat.

Quick Suds. Soap powder. 510,135. Sterling Soap Mfg. Co.

Kleeneze. Hand cleanser. 510,141. International Industrial Sales Co.

Woodhouse. Interior and exterior paints, varnishes, and paint enamels. 511,054. Samuel F. Woodhouse Co.

Super inksol. Ink remover. 515,552. C. P. Hall Co.

inksol. Ink remover. 515,553. C. P. Hall Co.

PARA-SCALECIDE. Concentrate in liquid form for the control of peach tree borer. 517,160. B. G. Pratt Co.

HEADCOAT. Ready-mixed paints and varn-

ishes. 521,073. Headquarters Paint and Varnish Co.

ANTI-RUST TWINS. Chemical preparations for the removal and prevention of rust. 523,108. Yosemite Chemical Co.

ARMSTRONG A CORK COMPANY. Cleaning preparations. 524,927. Armstrong Cork Co.

ARMSTRONG A CORK COMPANY. Cleannous, oleo-resinous, asphaltic, ligniferous, and caseinlatex type adhesive pastes and adhesive cements. 524,928. Armstrong Cork Co.

Safon. Ready-mixed finish containing hydrocarbon solvent and cellulose resin. 525,288. Safon Co.

Kidde. Carbon dioxide, oxygen, and chemical preparations used in the treatment of fibres of yarn or cord to bond the fibres and increase slip resistance. 526,650. Walter Kidde & Co., Inc.

Wilson. Household cleaning fluid. 527,085. Wilson Chemical Co.

PH^7. Chemical compound used as a rust preventive cleaner and preservative. 527,759. National Aluminate Corp.

Gone. Liquid deodorizer. 527,843. Real Silk Hosiery Mills, Inc.

Spic and Span. Soluble cleaner, cleanser, and detergent. 528,004. Procter and Gamble Co.

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(Symbol). Chemical wood preservatives, insecticides, fungicides, and bismuth salts. 529,984. Bolidens Gruvaktiebolag.

CC. Chemical products derived from petroleum —namely, liquid organic hydroperoxide methyl mercaptan and ethyl mercaptan. 530,171. R. T. Collier Corp.

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DREW WETSYN. Detergents for general use. 531,453. E. F. Drew & Co., Inc.

HARLEY-DAVIDSON. Synthetic enamels, varnish, and cleaners and polishers for finished enameled surfaces. 531,589. Harley-Davidson Motor Co.

C. S. R. Alkaline compound used as the electrolyte in the electrolytic, reverse current-cleaning of ferrous metals. 533,104. Wyandotte Chemicals Corp.

Faustone. Interior flat wall paint. 533,357. Phelan-Faust Paint Mfg. Co.

Hampden. Chemicals. 533,564. Hampden Color and Chemical Co.

80/LEAD and 20/ZINC = 100% PURE. J. F. Kurfees Paint Co.

80 and 20. Paints. 535,546. J. F. Kurfees Paint Co.

TETFOAM. Degreaser. 535,842. Henry B. Heller Corp

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KAM. Bottle washing compound. 536,571. Westvaco Chlorine Products Corp.

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KOTAPHANE. Synthetic resins, cellulose derivatives, and combinations thereof, in film or foil form. 537,740. Selectronic Dispersions, Inc.

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Metlbrite. Metal polish. 537,974. Boyle Midway, Inc.

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SPHERON. Carbon black. 540,166. Godfrey L. Cabot, Inc.

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MOTHMASTER. Insecticides and mothproofing agents. 542,429. American Moth Products Corp.

Detro-Tone. Paints. 542,661. Rogers Paint Products, Inc.

COMPO Adhesives make the better shoes. Adhesive shoe cement. 544,674. Compo Shoe Machinery Corp.

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Black Mask. Black utility paint enamel. 545,215. Baltimore Paint & Color Works.

NAIRN. Liquid compounds for cleaning linoleum, asphalt tile, and similar floor coverings. 545,341. Congoleum-Nairn, Inc.

(Symbol). Aluminum paint, colors in oil for coloring paints, barn paints, varnishes, turpentine, linseed oils, painting enamels, creosote oil paints, creosote stains, varnish stains, oil stains, and ready mixed paints. 545,591. Moore-Handley Hardware Co., Inc.

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Bond-Gard Primer. Paint primers. 546,672. Detroit Graphite Co.

DC. Unctuous organosilicon polymers for use as lubricants, as vibration damping media, as hydraulic media for transmitting power, and for releasing rubber and plastic moldings from their molds. 546,830. Dow Corning Corp.

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SEALPLY. Adhesive compound. 547,800. Vita-Var Corp.

Lavendo. Polishing preparations. 548,039. Wm Wren Ltd.

ETIMOLOS. Insecticides, weedicides, disinfectants, and bactericides. 548,172. Nathalie Von Dezen.

PITRALON ANTISEPTIC. Disinfectants. 548,518. Naamlooze Vennootschap Chemicalienhandel Odol Co.

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SYNTRON. Lubricating oils and greases. 549,094. Syntron Co.

Woodbury. Facial soap and shaving soap. 549,204. John H. Woodbury, Inc.

CLINTON. Laundry starch, modified starches for use in sizing for textiles and paper, dextrine for use in adhesives, lactic acid for use in tanning. 550,022. Clinton Industries, Inc.

COVARNISHBLAK. Preparation of carbon black, resin, and solvents for coloring paints and protective coatings. 550,113. Binney & Smith.

COZOL. Coning oil. 550,168. Procter & Gamble Co.

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ORTHOPHOS. Parasiticides. 550,383. California Spray-Chemical Corp.

PERSISTOPHOS. Parasiticides. 550,384. California Spray-Chemical Corp.

PERKINS GLUES. Urea formaldehyde and phenol formaldehyde resins. 550,431. Perkins Glue Co.

RPM DELO. Lubricating oils and diesel engine lubricating oil. 550,457. Standard Oil Co. of California.

LIGNOSITE. Powdered material from sulphite waste liquor employed as a dispersing agent for cement. 550,947. Puget Sound Pulp and Timber Co.

NATIONAL. Chemical fluxes for welding, brazing, soldering, and metal bonding. 551,035. National Cylinder Gas Co.

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EASTERN STATES. Lubricating oils and greases. 551,262. Eastern States Farmers' Exchange.

CASTROLEASE. Oils and greases for lubricating. 551,343. C. C. Wakefield & Co., Ltd.

SPHEEROL. Lubricating oils and lubricating greases. 551,345. C. C. Wakefield & Co. Ltd.

BASEKOTE. Lubricating grease. 551,548. Esso Standard Oil Co.

SLIPKOTE. Lubricating grease. 551,550. Esso Standard Oil Co.

EN-AR-CO. Lubricating oil and grease. 552,257. National Refining Co.

AGRASEAL. Waterproof coating. 552,286. Tamms Silica Co.

ACTO. Oils and greases. 552,512. Stanco Inc.

BRYNOX. Paint to be applied to exterior metal surfaces. 552,730. Alston-Lucas Paint Co.

PURUSOL. Soluble oil for use as cutting oil. 552,799. Pure Oil Co.

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Peerless. Starch. 553,471. Corn Products Refining Co.

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HI-GAM. Agricultural insecticides. 554,322. Pennsylvania Salt Mfg. Co.

D-C. Lubricating oils. 554,649. Cities Service Oil Co.

RESIPROOFER. Insecticide. 555,084. Residex Corp.

BLACK DIAMOND. Printing inks. 555,328. Western Newspaper Union.

Zest. Hand and bath soap. 555,476. Armand Co.

BLANCOPHOR. Fluorescent dyestuffs which convert ultra violet rays into visible white light. 555,497. General Dyestuff Corp.

U NO ME. Tri-sodium phosphate. 555,537. Jewel Tea Co., Inc.

KURFEES. Liquid cleaners. 557,281. J. F. Kurfees Paint Co.

KURFEES. Liquid cleaners. 557,282. J. F. Kurfees Paint Co.

GOULAC. Adhesive employed as a binder or bonding agent in the manufacture of cores. 557,333. American Gum Products Co.

DUCO. Adhesive cement. 557,830. E. I. du Pont de Nemours & Co.

KNUCKLE SAVER. Penetrating oils. 557,840. Franklin Chemical Co.

BIOLITE. Chemical toxicants. 557,861. Monsanto Chemical Co.

MITOSAN. Chemical toxicants. 557,863. Monsanto Chemical Co.

RANDOX. Chemical toxicants. 557,864. Monsanto Chemical Co.

INVISIBLE ACCESSORY. Toilet soap and laundry soap. 558,008. Consolidated Cosmetics.

VICAR DEE. Cleanser in powder form. 558,183. Virginia-Carolina Chemical Corp.

VICAR San. Alkaline cleanser in powder form. 558,187. Virginia-Carolina Chemical Corp.

PHD. Specially prepared hydrated lime for insecticidal use. 558,191. Warner Co.

dgf 123. Lubricant compositions containing graphite. 558,267. A P Parts Corp.

VELVA PINE. Preparation for cleaning walls, tile and the like. 558,507. Peerless Sal-O-Well Co., Inc.

Golden Chance. Soap. 558,716. Harriet Hubbard Ayer, Inc.

ALLSTATE. Chemical preparations used for automobile supplies. 558,746. Sears, Roebuck & Co.

IMPERIAL SUPER SPOTTER. Non-explosive cleaning compound. 560,468. C. N. Hubbard.

Mineralite. Fertilizer composition. 561,201. Edwin G. Learnard.

NU-RAY. Cleaning preparations for household use. 561,216. Robinson Brothers Buffalo Ammonia Inc.

Cachalot. Higher aliphatic alcohols from C_{10} to C_{20}. 562,076. M. Michel & Co., Inc.

Childsco. Hand soap, and all-purpose cleaning preparation. 562,323. Childsco Products Co.

MYVEROL. Monoesters of polyhydric alcohols. 562,547. Distillation Products, Inc.

MOISET. Printing inks. 562,652. Miller-Cooper Ink Co.

BYCOLIFE. Fertilizer and more especially a fertilizer containing an insecticide. 562,978. Bycolife Fertilizer Mfg. Co.

CALOL. Insecticidal carriers and solvents. 563,030. Standard Oil Co. of California.

COOPER. Antiseptic, disinfectant, germicidal, and insecticidal preparations. 563,156. William Cooper & Nephews, Inc.

Fluorium. Whitening and brightening material for use in washing textiles. 563,597. Beach Soap Co.

PURE. Automobile radiator cooling system chemical cleaner, sealer, anti-rust, insect spray (insecticide), radiator anti-freeze, and hydraulic brake fluid. 563,632. Pure Oil Co.

NATWET. Preparation for increasing the spreading and penetrating qualities of water. 563,947. National Foam System, Inc.

FOSKLOR. Chlorinated phosphatic detergent. 564,173. Westvaco Chemical Corp.

FOSKLOR. Chlorinated phosphatic compound used as a bactericide, disinfectant, and germicide. 564,174. Westvaco Chemical Corp.

(Symbol). Fertilizers. 564,257. Norsk Hydro-Elektrisk Kvaelstofaktieselskab.

Tromete. Chemical cleaning compound for general use, having incidental properties as a water softener. 564,489. Westvaco Chemical Corp.

SPONGE-AWAY. Animal insecticide. 564,608. William Cooper & Nephews, Inc.

CARIBEE. Fertilizers. 564,626. International Minerals & Chemical Corp.

STED. Surface active agents. 564,780. Monsanto Chemical Co.

MOTHEX. Mothproofing liquids, moth cakes, and moth crystals. 565,007. Roseth Corp.

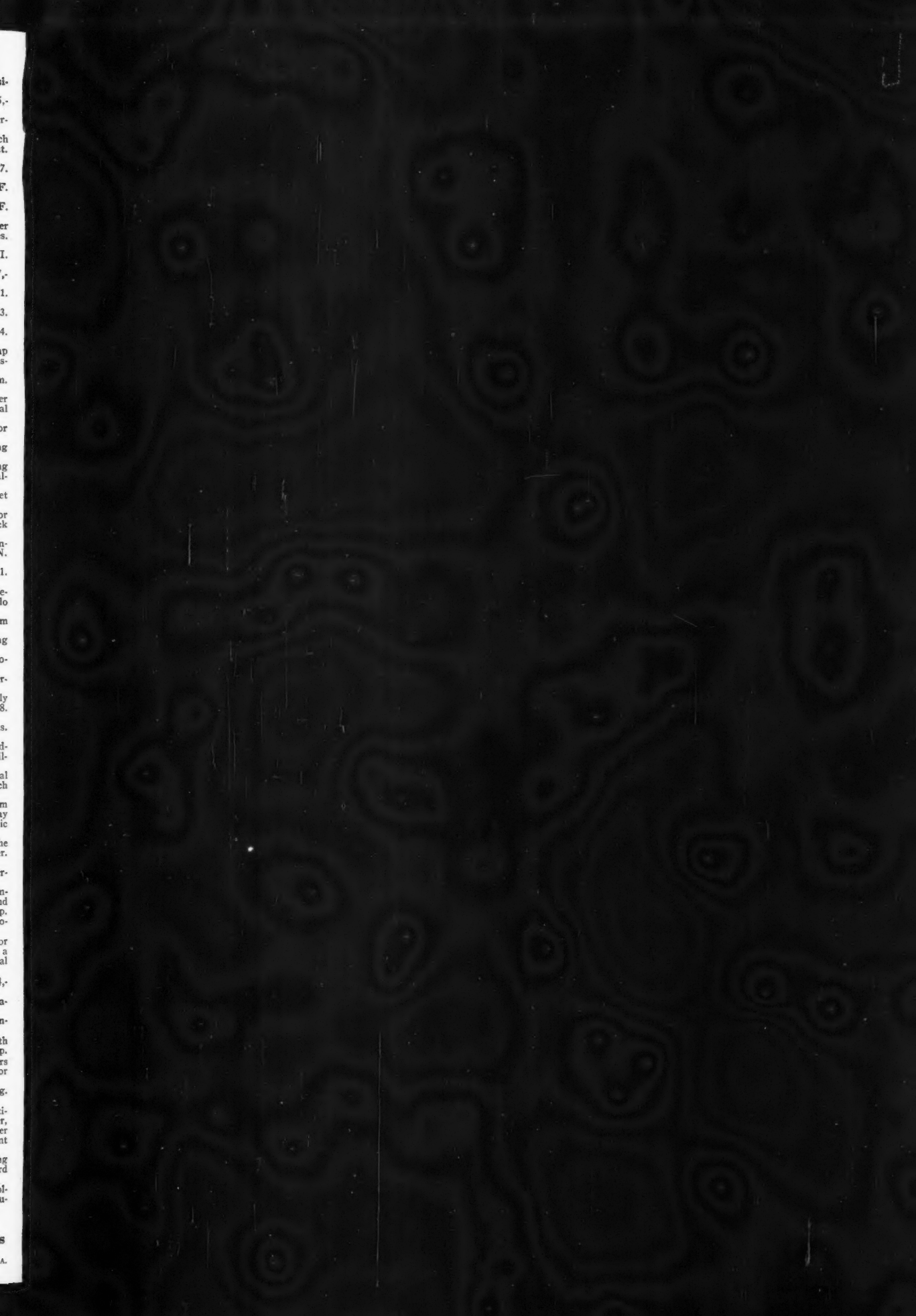
TORNADO. Cleaning compound for floors and walls, and a shampoo preparation for cleaning rugs. 565,039. Breuer Elec. Mfg. Co.

Brunsco. Leather cleaner and leather dressing. 565,472. Brunswick-Balke-Collender Co.

Fomoco. Antifreeze alcohol and other anti-freeze liquids, cooling system chemical cleanser, emulsion type rust inhibitor, shock absorber fluid, hydraulic brake fluid, and water repellent solution for fabrics. 569,130. Ford Motor Co.

Fomoco. Lubricating greases and lubricating compounds containing graphite. 569,139. Ford Motor Co.

Fomoco. Metal polish, metal cleaner, upholstery cleaner, windshield and car washing solution. 569,141. Ford Motor Co.



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AGRASEAL. Waterproof coating. 552,286. Tamms Silica Co.

ACTO. Oils and greases. 552,512. Stanco Inc.

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Superior. Starch. 553,472. Corn Products Refining Co.

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KURFEES. Liquid cleaners. 557,281. J. F. Kurfees Paint Co.

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GOULAC. Adhesive employed as a binder or bonding agent in the manufacture of cores. 557,333. American Gum Products Co.

DUCO. Adhesive cement. 557,830. E. I. du Pont de Nemours & Co.

KNUCKLE SAVER. Penetrating oils. 557,840. Franklin Chemical Co.

BIOLITE. Chemical toxicants. 557,861. Monsanto Chemical Co.

MITOSAN. Chemical toxicants. 557,863. Monsanto Chemical Co.

RANDOX. Chemical toxicants. 557,864. Monsanto Chemical Co.

INVISIBLE ACCESSORY. Toilet soap and laundry soap. 558,008. Consolidated Cosmetics.

VICAR DEE. Cleanser in powder form. 558,183. Virginia-Carolina Chemical Corp.

VICAR San. Alkaline cleanser in powder form. 558,187. Virginia-Carolina Chemical Corp.

PHD. Specially prepared hydrated lime for insecticidal use. 558,191. Warner Co.

dgf 123. Lubricant compositions containing graphite. 558,267. A P Parts Corp.

VELVA PINE. Preparation for cleaning walls, tile and the like. 558,507. Peerless Sal-O-Well Co., Inc.

Golden Chance. Soap. 558,716. Harriet Hubbard Ayer, Inc.

ALLSTATE. Chemical preparations used for automobile supplies. 558,746. Sears, Roebuck & Co.

IMPERIAL SUPER SPOTTER. Non-explosive cleaning compound. 560,468. C. N. Hubbard.

Mineralite. Fertilizer composition. 561,201. Edwin G. Learnard.

NU-RAY. Cleaning preparations for household use. 561,216. Robinson Brothers Buffalo Ammonia Inc.

Cachalot. Higher aliphatic alcohols from C_{10} to C_{20}. 562,076. M. Michel & Co., Inc.

Childsco. Hand soap, and all-purpose cleaning preparation. 562,323. Childsco Products Co.

MYVEROL. Monoesters of polyhydric alcohols. 562,547. Distillation Products, Inc.

MOISET. Printing inks. 562,652. Miller-Cooper Ink Co.

BYCOLIFE. Fertilizer and more especially a fertilizer containing an insecticide. 562,978. Bycolife Fertilizer Mfg. Co.

CALOL. Insecticidal carriers and solvents. 563,030. Standard Oil Co. of California.

COOPER. Antiseptic, disinfectant, germicidal, and insecticidal preparations. 563,156. William Cooper & Nephews, Inc.

Fluorium. Whitening and brightening material for use in washing textiles. 563,597. Beach Soap Co.

PURE. Automobile radiator cooling system chemical cleaner, sealer, anti-rust, insect spray (insecticide), radiator anti-freeze, and hydraulic brake fluid. 563.632. Pure Oil Co.

NATWET. Preparation for increasing the spreading and penetrating qualities of water. 563,947. National Foam System, Inc.

FOSKLOR. Chlorinated phosphatic detergent. 564,173. Westvaco Chemical Corp.

FOSKLOR. Chlorinated phosphatic compound used as a bactericide, disinfectant, and germicide. 564,174. Westvaco Chemical Corp.

(Symbol). Fertilizers. 564,257. Norsk Hydro-Elektrisk Kvaelstofaktieselskab.

Tromete. Chemical cleaning compound for general use, having incidental properties as a water softener. 564,489. Westvaco Chemical Corp.

SPONGE-AWAY. Animal insecticide. 564,608. William Cooper & Nephews, Inc.

CARIBEE. Fertilizers. 564,626. International Minerals & Chemical Corp.

STED. Surface active agents. 564,780. Monsanto Chemical Co.

MOTHEX. Mothproofing liquids, moth cakes, and moth crystals. 565,007. Roseth Corp.

TORNADO. Cleaning compound for floors and walls, and a shampoo preparation for cleaning rugs. 565,039. Breuer Elec. Mfg. Co.

Brunsco. Leather cleaner and leather dressing. 565,472. Brunswick-Balke-Collender Co.

Fomoco. Antifreeze alcohol and other anti-freeze liquids, cooling system chemical cleanser, emulsion type rust inhibitor, shock absorber fluid, hydraulic brake fluid, and water repellent solution for fabrics. 569,130. Ford Motor Co.

Fomoco. Lubricating greases and lubricating compounds containing graphite. 569,139. Ford Motor Co.

Fomoco. Metal polish, metal cleaner, upholstery cleaner, windshield and car washing solution. 569,141. Ford Motor Co.

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